



# RadianceXD/XE<sup>®</sup>

Video Processor

Owner's Manual



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**Unless you are experienced in the installation and set-up of high-performance video electronics, we suggest you hire a professional home-theater specialist to do installation and configuration of this product. We recommend that you choose a professional who has been certified by the Imaging Science Foundation™ (ISF).**

This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to Part 15 of the FCC rules, Canadian ICES-003, and CISPR 22. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Unauthorized modifications to this equipment may void Lumagen's limited warranty and the user's authority to operate this equipment.

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# WARNINGS:

- **Do not defeat the safety features of the power supply or power cord, such as, but not limited to, removing the ground pin connection.**
- **Do not open, insert objects into, or spill liquid into, this equipment.**
- **Do not block the cooling vents.**
- **Do not program an output resolution that exceeds the maximum specified refresh rate of the attached television, or projector.**
- **Improperly set gray-bar intensity may accelerate screen burn-in. Consult a home-theater specialist for help setting gray-bar intensity.**



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# Section 1 – Getting Started

## **Section 1 – Getting Started**

### **Introduction**

Thank you for purchasing a Lumagen® Radiance™ video processor. The Lumagen Radiance Video Processor series boasts the highest-performance video switching, processing and calibration available. This makes it ideal for high-definition home and commercial theater applications. Lumagen's Radiance series refines and enhances the video images presented by high definition front projectors, top-level rear-screen and flat-panel displays. At the same time the Radiance functions as an extensive central switching hub ideal for home and corporate theater systems.

The RadianceXD, and the RadianceXE, combine proprietary strides in video technology with enhanced connectivity and the flexibility of up to 18 video and 18 audio inputs. The RadianceXD is HDMI 1.1, while the RadianceXE is HDMI 1.3. Note that they have the same feature set, except the RadianceXE adds HDMI 1.3 bitstream audio formats for Dolby-Digital TrueHD™ and DTS Master-Audio™.

By incorporating improved video de-interlacing, new MPEG artifact reduction and temporal noise reduction, the Radiance series expands upon the company's well-known Vision series – a line which received industry recognition for advancements in switching, calibration and proprietary No-ring™ scaling technologies.

The Radiance offers 10-bit processing, per-pixel standard definition (SD) and high definition (HD) video de-interlacing with adaptive diagonal filtering, scaling technology that does not add ringing (unlike competing products), MPEG mosquito and block artifact reduction and “3D” temporal noise reduction for both SD and HD sources. For these reasons, the Radiance™ processor sets the industry benchmark for switching, calibration and video processing performance.

### **Key Features**

- 10-bit processing
- Proprietary Lumagen No-ring™ scaling
- Each input has 4 user configuration memories
- Each input user configuration memory has 8 resolution sub-memories (for HD inputs)
- Each resolution sub-memory is linked to one of 8 output configurations.
- 2:2, 3:2 and 3:3 pull-down for SD/HD film sources
- Per-pixel SD/HD video de-interlacing
- Adaptive diagonal filtering
- MPEG mosquito and block artifact reduction
- Temporal noise reduction for SD/HD sources
- Output resolution from 480p to 1080p, plus 1080i
- User programmable non-linear-stretch (NLS) mode
- 4:3, LBOX, 16:9, 1.85, 2.35 and NLS input aspect ratios
- Programmable output aspect ratio from 1.33 to 2.50
- Extensive support for anamorphic lenses
- Automatic detection for NTSC, PAL and SECAM
- Extensive suite of test patterns
- Parametric grayscale calibration
- Parametric Gamma
- Full CMS (Color Management System) for primary and secondary color calibration
- Programmable input/output color-space
- Y/C-delay calibration
- CUE and ICP filtering
- Eight channel audio up to 192 kHz, DD True-HD™ 5.1, and DTS Master Audio™ 5.1
- Two 12-volt trigger outputs
- IR and RS232 control (See Tech Tip 11)
- LVTTTL IR format command input LVTTTL IR format command input (See Tech Tip 9)
- Universal power supply, INPUT:100-240V~50/60Hz, 1.5A OUTPUT:12.0V, 5.0A

# Section 1 – Getting Started

## Document Conventions and Menu Navigation

Commands are selected with the supplied infrared remote or the RS232 serial port. To prevent possible command conflict, only one of these methods of command should be used at a time.

The infrared remote control command notation is described below:

- Remote buttons are named as shown on the remote in a bold font.  
Example: **MENU**.
- For comma separated lists, press the buttons in the sequence shown.
- For parenthesized lists, select one button from the list.
- For square-bracketed lists, press the buttons as needed.  
Example: For the list [..., †, ‡, ^], press the arrow keys as needed.
- For menu commands press the **MENU** button. The ‡ and ^ arrow keys are used to select the function. The † arrow key (or OK) is used to enter sub-menus. This is shown as: **MENU** → **MenuItem** → **MenuItem**. The ... arrow key (or **EXIT**) steps up one menu level.
- Numerical entries are listed as **value**. While entering the value, the ... arrow key acts as a backspace key.
- Some commands are activated immediately. Other commands must be explicitly accepted by pressing **OK**. If needed, **OK** is listed as part of the command.
- Pressing **EXIT** cancels a partially completed command. If the menu system is active, **EXIT** returns to one level higher in the menu system.
- There are four independent configuration memory types for each input (**MEMA**, **MEMB**, **MEMC** and **MEMD**). The input setup and output resolution/timing can be set independently for each memory. To program an input memory, first select the input, then select the desired configuration memory and use the menu system to configure.
- Some menu commands are only available when their associated input is selected.
- Before changes are saved, they can be discarded by entering standby (**STBY**) mode.
- To prevent unintended configuration changes, before saving, use the **Lock** command.
- Save the configuration after making changes, otherwise the changes will be lost when entering **STBY** mode.

If the serial port is used, the ASCII character associated with the respective remote control button must be sent. See the Serial RS232 Command Interface section for information on serial commands.

## Unpacking

- Unpack the box.
- Make sure that you remove all of the accessories from the packing.
- Save the box and packing materials in case you need to ship your Radiance.

## Check the Components

Verify that your box contains the following items:

- Lumagen Radiance video processor
- Universal power-supply, INPUT: 100-240V~50/60Hz
- Remote control
- AAA Batteries (2)
- Rack ears
- Radiance Owner's Manual
- RS232 Null-modem cable

## Remote Control Battery Installation

Use the following procedure to install batteries in the remote:

1. Locate the battery compartment on the back of the remote control.
2. Move the locking tab to open the door.
3. Remove the old batteries (if applicable).
4. Install two new AAA batteries, observing the battery polarity shown in the battery compartment.
5. Replace the battery compartment cover.

# Section 1 – Getting Started

## Display Compatibility Requirement

The Radiance is compatible with a wide variety of displays. The display must have an input that supports 480p or higher resolution. The display should have an HDMI or DVI digital input. Displays with an analog component or RGB input can be used if the user provides an external HDMI/DVI to analog video converter.

The Radiance has support for HDCP (High-bandwidth Digital Content Protection). To display a signal from a video source that supports HDCP, requires that a display with support for HDCP to be connected to the output of the Radiance.

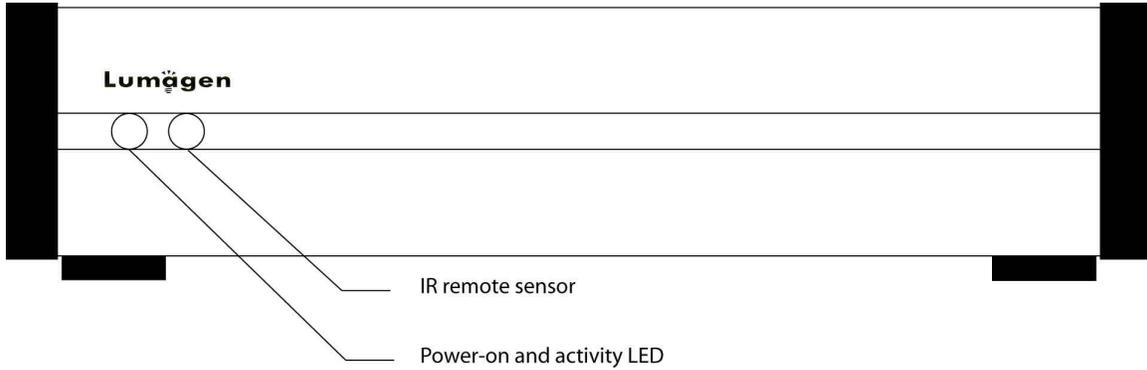
## Installation Guidelines

- Install the Radiance on a flat, level surface such as a table or shelf.
- Alternately the Radiance can be installed in an equipment rack by using the optional rack mount ears available from Lumagen.
- Select a well-ventilated, dry location.
- Verify that the cooling vents are clear of obstructions to provide convection cooling.
- Only use the supplied power supply.
- Avoid sudden temperature changes, temperature extremes and excessive humidity.
- Use only accessories that are approved by Lumagen for use with this equipment.
- Unplug power to the Radiance before cleaning.

# Section 2 – Overview

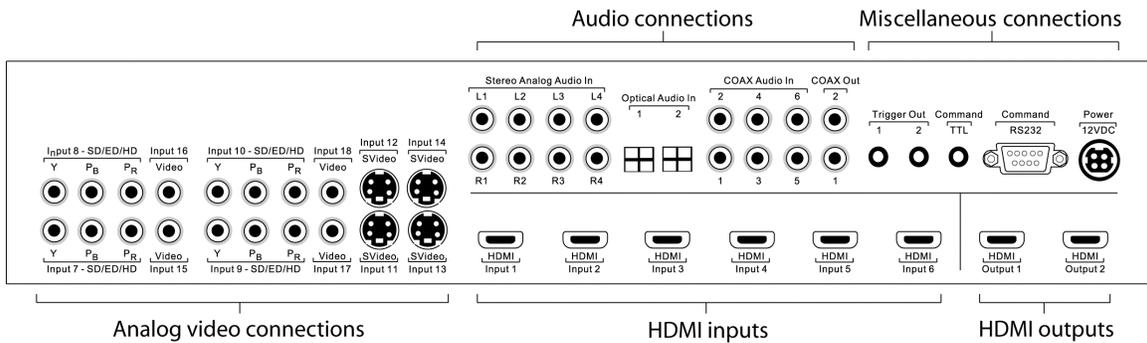
## Section 2 – Overview

### Front Panel



The front panel has a light-emitting-diode (LED) indicator, which is red when the unit is in “standby” and, by default, is green when the unit is “on.” Note that the green “on” indicator can be turned off if preferred.

### Rear Panel



There are six HDMI, and 12 analog, video inputs. Audio can be received on the active HDMI input, one of four analog stereo inputs, or one of eight digital audio inputs.

There are two HDMI video outputs and two COAX audio outputs. Video can be output on one or both of the HDMI outputs. Audio can be output on the HDMI outputs and/or both COAX outputs.

Additional connections are provided for LVTTTL command input (38 KHz IR format), two 12-volt trigger outputs, RS232 command and update, plus the 12 VDC power input.

These connections are described on the following page.

# Section 2 – Overview

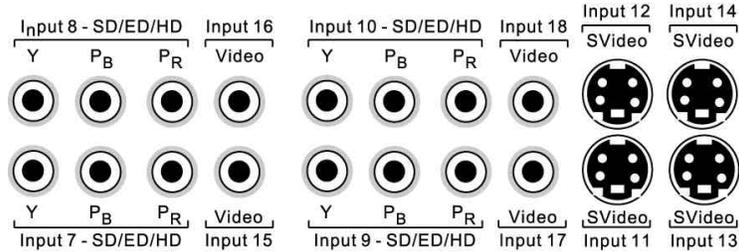
## HDMI Connections



- 6 HDMI SD/HD Inputs. Supports resolutions from 480i/576i up to 1080p60
- 2 HDMI SD/HD Outputs. Supports resolutions from 480p/576p up to 1080p60

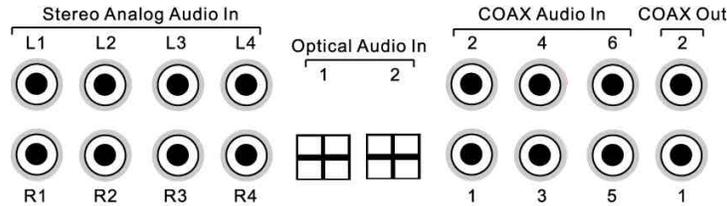
Note: CEC bit pass-through connected from HDMI inputs to HDMI Output 1 only.

## Analog Video Input Connections



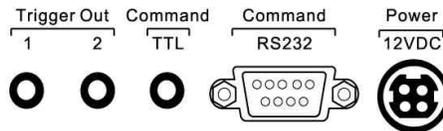
- 4 Component / RGB Inputs / RGBcvS. Supports resolutions up to 720p60, 1080i30. Input 10 can be used as an RGBHV Input. In this Mode VSync uses Input 17, and HSync uses Input 18. Each of these inputs can support RGBcvS. For this RGBcvS, an input is combined with the adjacent composite video input (i.e. Input 7 + cvS on Input 15).
- 4 S-video Inputs. Supports NTSC, PAL and SECAM.
- 4 Composite Inputs. Supports NTSC, PAL and SECAM.

## Audio Input and Output Connections



- 4 Stereo Analog Audio Inputs
- 2 Optical Digital Audio Inputs
- 6 COAX Digital Audio Inputs
- 2 COAX Digital Audio Outputs

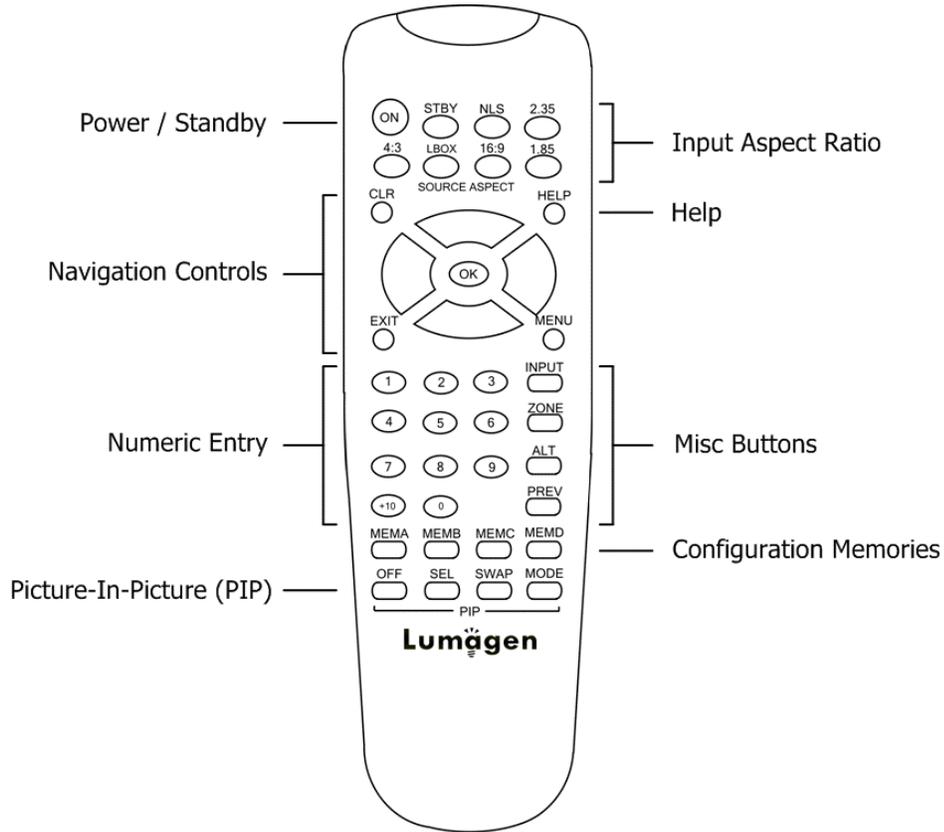
## Miscellaneous Connections



- 2 Trigger Output (12V at 100mA inductive, or 250mA non-inductive, load)
- 1 LVTTTL IR format command input (See Tech Tip 9).
- 1 RS232. Used for command and for software update (See Tech Tip 6 and 11).
- 1 Power Input (12 Volts DC)

# Section 2 – Overview

## Remote Control



### Power / Standby

**ON** Power On  
**STBY** Standby

### Navigation Control

**CLR** Clear menu or partial commands  
**HELP** Display context-sensitive help  
**EXIT** Go back one menu level  
**OK** Enter/Accept command, display info screen  
 $\ddagger$  Menu navigation / zoom in  
 $\sim$  Menu navigation / zoom out  
 $\dots$  Menu navigation / input aspect  
 $\dagger$  Menu navigation / input aspect

### Numeric Entry

**1-9** Input 1 to 9  
**+10** Input 10 and greater

### Picture-In-Picture (PIP)

**OFF** Turn PIP off  
**SEL** Turn PIP on. Ready for PIP input selection  
**SWAP** Swap PIP and main view  
**MODE** Select PIP mode

### Input Aspect Ratio

**4:3** 4:3 (1.33) aspect ratio  
**LBOX** Letterbox  
**16:9** 16.9 (1.78) aspect ratio  
**1.85** 1.85 aspect ratio  
**2.35** 2.35 aspect ratio  
**NLS** Non-Linear-Stretch

### Misc Buttons

**INPUT** Precedes input # selection  
**ZONE** <not implemented>  
**ALT** Alternate info screens  
**PREV** Previous output

### Configuration Memories

**MEMA** Memory A  
**MEMB** Memory B  
**MEMC** Memory C  
**MEMD** Memory D

# Section 2 – Overview

## Block Diagram

The function of the Radiance is to act as a video switch, process the selected video source and then output video in the appropriate format and resolution. Standard definition (SD), enhanced-definition (ED), high-definition (HD) video inputs, plus a number of PC formats are supported. Video inputs are converted to progressive video (if necessary) and are then scaled to the video output resolution.

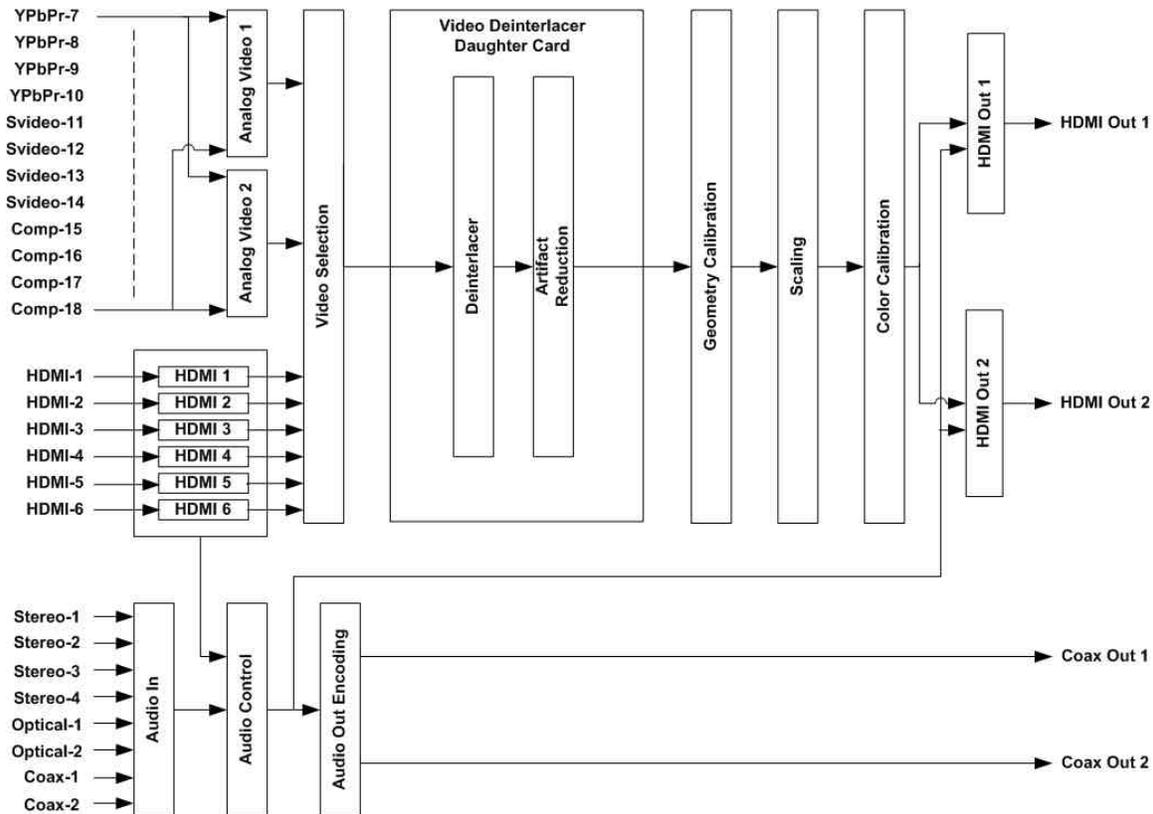
Interlaced video has been in use for more than 50 years and is still the most common video format. It displays half of the lines of picture information each sixtieth (or fiftieth) of a second. Each half of the image is called a field and displays either all the even lines, or all the odd lines. So, an entire image, called a frame, takes a thirtieth (or twenty-fifth) of a second to display on the screen. An “i” suffix on the resolution specification is used to indicate interlaced formats.

In contrast, progressive video presents each frame as a whole. A “p” suffix on the resolution specification is used to indicate progressive formats. Converting interlaced video to progressive video is referred to as “deinterlacing.”

The Radiance is comprised the following major functional sections:

- Video input selection with conversion to digital (if needed) and video decoding
- Video deinterlacing
- Video filtering and scaling
- Video output of HDMI digital video
- Audio input selection
- Audio control
- Audio output encoding

The functional blocks are shown below.



## Section 2 – Overview

Composite and SVideo inputs automatically select between NTSC, PAL and SECAM formats. The component, RGB and HDMI inputs accept SD, ED and HD video at 24, 50 or 59.94 Hertz. HDCP encryption is supported for the HDMI inputs. This is not just a “pass-through” function. If the signal is encrypted, the HDMI inputs are decrypted, processed, scaled and then re-encrypted for output as HDMI. For HDCP encrypted inputs, a HDCP capable display is required.

If the video input is interlaced, it is first deinterlaced into a progressive format. User enabled noise reduction algorithms are then applied. Proprietary No-ring™ scaling algorithms are used to scale the resulting progressive video to the optimal size for the display.

As part of the scaling process, digital filtering is used to enhance the image detail. This enhancement allows standard definition inputs, such as DVDs, to appear to be much higher resolution. This is especially valuable when standard-definition sources are viewed on the large screen sizes common in home theaters.

HDMI RGB format video can use “PC” range (full range black to white), or “video” range (allows for blacker-than-black and whiter-than-white levels). The level is user selectable, and must be set to match the video source (in the respective input memory) and display (in the respective output configuration). Note: HDMI component video (i.e. 4:4:4 and 4:2:2) can only be video level per the HDMI specification.

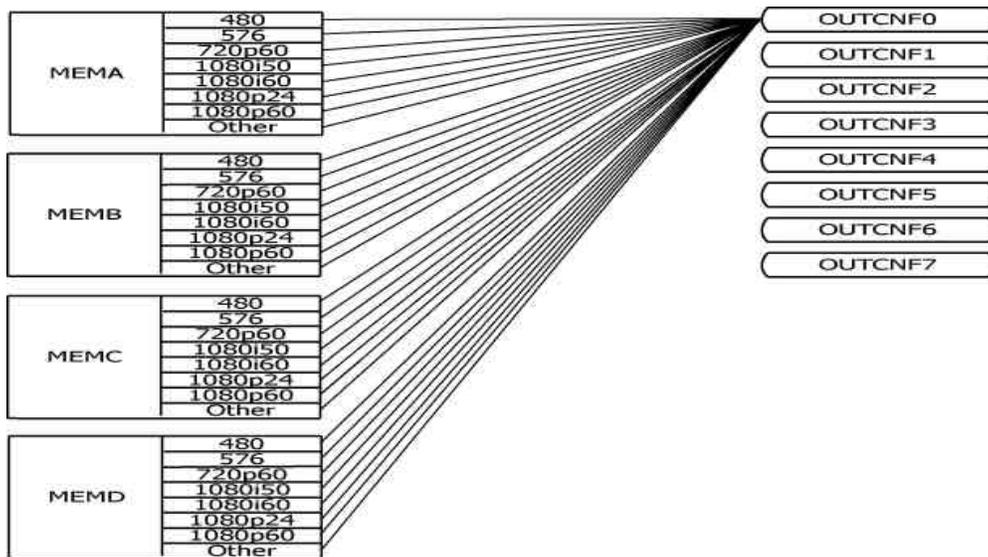
Commands can be sent by infrared remote or via the serial RS232 port. The RS232 port is used for software updates. Setup is done with the on-screen menu. User functions (e.g. select input) use direct commands.

### Configuration Memories

To understand how the Radiance functions, it is important to note that setup and calibration parameters are split into “input memories” and “output configurations.” Input memories deal with video source setup and calibration. Output configurations deal with display setup and calibration.

The Radiance has four input memories (**MEMA**, **MEMB**, **MEMC** and **MEMD**). Each input memory has eight resolution sub-memories that are automatically selected for input resolutions of 480, 576, 720p60, 1080i50, 1080i60, 1080p24, 1080p60 and Other. The eighth resolution sub-memory, “Other,” is reserved as a “catch-all” for otherwise unspecified resolutions.

Each resolution sub-memory can be independently linked to any one of eight output configuration memories. The output configuration memories are used to store setup data for one, or more, video displays. In the factory default condition, all of the resolution sub-memories are linked to “Output Configuration 0.” As an example, to select output configuration number 1 for the active input memory/sub-memory, enter **MENU** ® **Input** ® **Video Setup** ® **[resolution]** ® **Out1 Select** ® **Config1** ® **OK**. The new output configuration must be selected for each input sub-resolution memory that is to be associated with the new output configuration. After selecting the new output configuration, it becomes active and its configuration setup can then be changed. To “Save” this new setting, enter **MENU** ® **Save** ® **Save** ® **OK**.



Initial “Input Memory” and “Output Configuration” Organization

## Section 2 – Overview

### PIP Window

There is a versatile PiP (Picture-in-Picture) system. Turning on the PiP window will display a second video image that is superimposed on top of the main, full screen, video image. There are 10 PiP mode memories available (0 – 9). Each PiP mode memory has independent settings for the video input, position, size, density (transparency), aspect ratio, and user memory. You can use the PiP to view any video source that is connected to the Radiance, or to display a control menu from another device, such as a receiver.

The PiP window can display an analog input with the limitation that, if the main window is an analog source, the PiP window can either display the same analog source or an HDMI source. If the main window is an HDMI source then the PiP window can display any source.

The aspect and memory control functions are available for the PiP window. Pressing the aspect or user memory “MEM A” to “MEM D” buttons after pressing PiP “SEL” (select) or PiP “MODE” sets the aspect or memory for the PiP window. Note: if you're not using the per-input memory usage setting (**MENU ® Other ® Memory Usage ® Per Input**), then changing the user memory for the PiP window also changes the user memory for the main window. Auto-aspect also works for the PiP window. The 'Letterbox' aspect, which is defined to be an aspect greater than 4:3 within a 4:3 aspect, is just treated as 4:3 (so you'll see bars on top and bottom). Similarly the '2.35' aspect, which is defined to be 2.35 inside a 16:9 aspect, is just treated as 16:9 (so again top/bottom bars are visible).

### PiP Setup Menu

PiP has 10 modes that are selectable with the PiP “MODE” button on the remote. Each PiP mode can have a unique position, size, and density (transparency). The command is:

**MENU ® Other ® PiP Setup ® OK**

Program the desired PiP parameters as shown below:

<b>Mode#</b>	Select one of 10 available PiP modes
<b>X</b>	Select the horizontal position for the PiP window
<b>Y</b>	Select the vertical position for the PiP window
<b>Size</b>	Select the PiP window size
<b>Density</b>	Select the PiP window transparency
<b>Timer</b>	Specify if PiP remains enabled until turned off (“off”) or automatically turns off after a specified delay (in seconds)
<b>Label</b>	Specify if the input label is displayed when PiP window is selected

### PiP Input Mask

The ability to mask the PiP along with the “PiP Timer” setting allows creation of a special PiP window for an output from an AVR or other equipment that displays menus. So, for instance, a programmable remote could turn on the PiP for an AVR when adjusting a volume control and just the slice of the menu from the AVR with the volume display could be overlaid onto the screen and the PiP window could be programmed to automatically turn off after a programmed time using the PiP Timer. See the *Input Mask* section for information on programming an input mask.

### PiP Remote Control Buttons

The PiP window has a label that displays its input name for a few seconds when the PiP is accessed with the PiP remote buttons PiP “SEL”, PiP “SWAP”, and PiP “MODE”.

**OFF:** Press to turn off the PiP window.

**SEL:** When pressed will turn on the PiP window, if not already on. After pressing PiP “SEL”, pressing a number selects that input as the PiP input. Once PiP “SEL” is pressed you can continue to change the PiP input by pressing number keys. Once a non-numeric button on the remote is pressed, pressing a number will switch the main-window input.

**SWAP:** Swaps the main window and PiP window. When swapping, the screen may blank for several seconds. To apply the original PiP window input calibration settings, to the main window.

**MODE:** When pressed will turn on the PiP window, if not already on. After pressing PiP “MODE”, pressing “0-9” selects one of the 10 PiP modes. The PiP mode controls the PiP window video input, position, size, density (transparency), aspect ratio, and user memory. After the PiP “MODE” button is pressed you can continue to change the PiP mode by pressing number keys. Once a non-numeric button on the remote is pressed, pressing a number will switch the main-window input. To change PiP mode settings go to **MENU ® Other ® PiP Setup** in the menu.

# Section 3 - Setup

## **Section 3 – Quick Setup Guide**

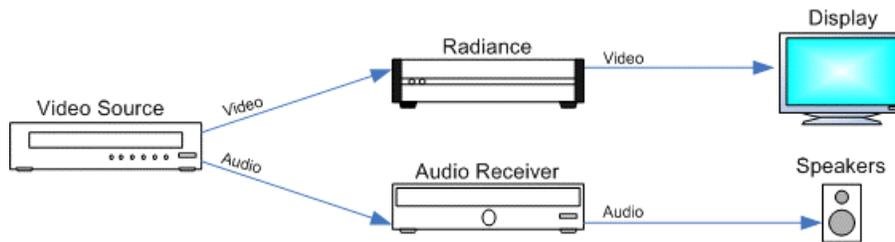
There are a number of system configurations that can be used when installing your Radiance. Which one you use will depend on the specifics of your installation, such as if you have multiple displays and how you wish to connect audio.

### **System Configurations**

The most common configurations using the Radiance are shown below.

#### **1. Audio and Video routed separately.**

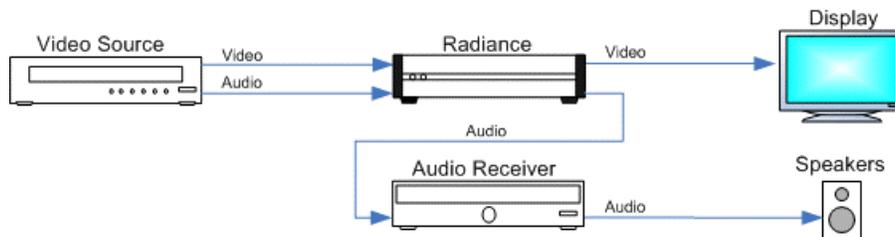
Connect the display to a Radiance HDMI output. Since audio is not used in the display for this case, turn off the Radiance HDMI output audio, for both outputs, in the Audio menu.



#### **2. Receiver after Radiance.**

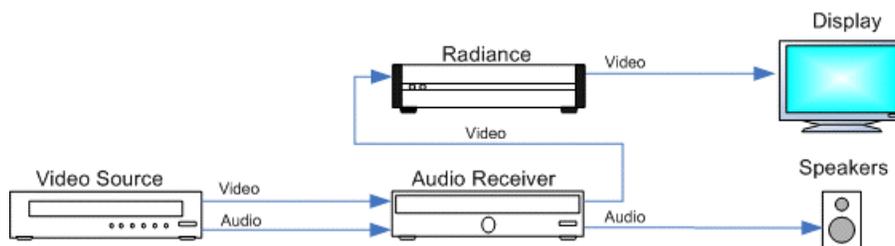
Normally the amplifier is connected to HDMI Output 1, and the display to HDMI Output 2. Many amplifiers do not accept audio for non-standard video rates, such as 768p, or at any rate above 720p/1080i. If this is the case for your system, see the audio setup section of this manual for more information. Note that some amplifiers will not report EDID back to the Radiance unless the amplifier's HDMI output is turned off, or it has an active display attached to its HDMI output. If you are not using audio in the display, turn off the respective Radiance HDMI output's audio in the Audio menu.

If you connect the Radiance coax audio output to a receiver, you can use HDMI audio or coax/SPIDF audio from the video source. You will get the same, or potentially even better, quality audio by using the coax/SPIDF audio output from the video source. If you are not using audio in the display, turn off the audio on both Radiance HDMI outputs and make sure that the SPDIF audio output is on in the Audio menu.



#### **3. Receiver in front of Radiance.**

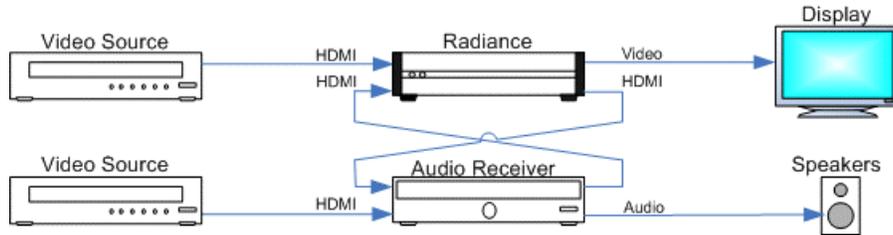
Connect the amplifier's video output (analog or HDMI/DVI) to an appropriate Radiance video input, and the display's HDMI input to a Radiance HDMI output. If you are not using audio in the display, turn off the respective Radiance HDMI output's audio in the Audio menu. In addition the Audio menu should be used to change the Audio EDID reported back to the amplifier to "User EDID."



# Section 3 - Setup

## 4. Receiver in front of and after the Radiance.

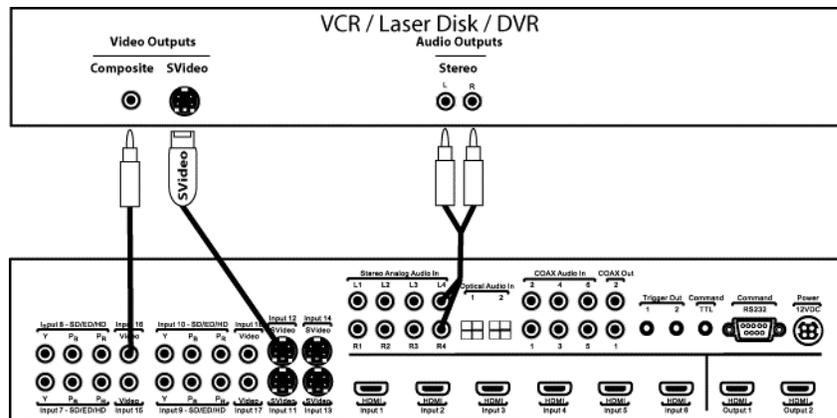
Connect the amplifier's HDMI video output to an appropriate Radiance video input, and connect the Radiance's first video output to an appropriate amplifier video input. Connect the display's HDMI input to the Radiance's second HDMI output. If you are not using audio in the display, turn off the respective Radiance HDMI output's audio in the Audio menu. In addition the Audio menu should be used to change the Audio EDID reported back to the amplifier to "User EDID."



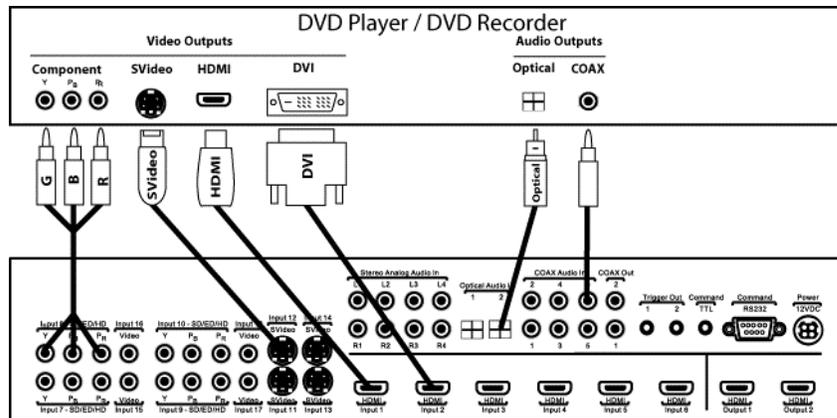
## System Hook-up Examples

The following illustrations show the types of cables, which can be used to connect typical video sources to the Radiance. Multiple possibilities are shown for some sources, but only a single audio and a single video connection are required.

### VCR/Laser Disk/DVR

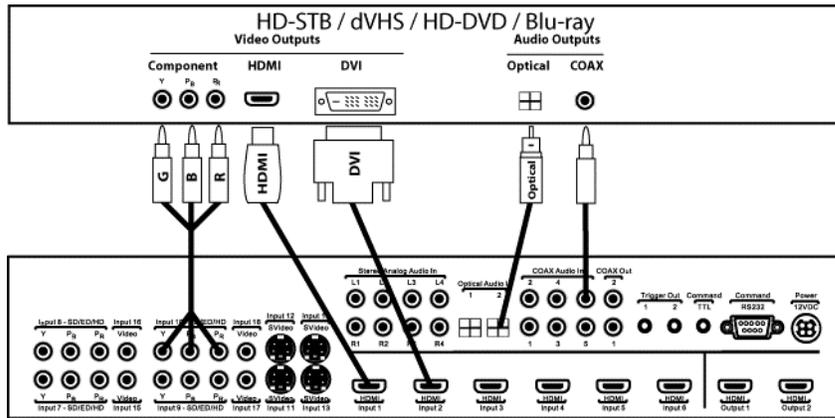


### DVD Player/DVD Recorder

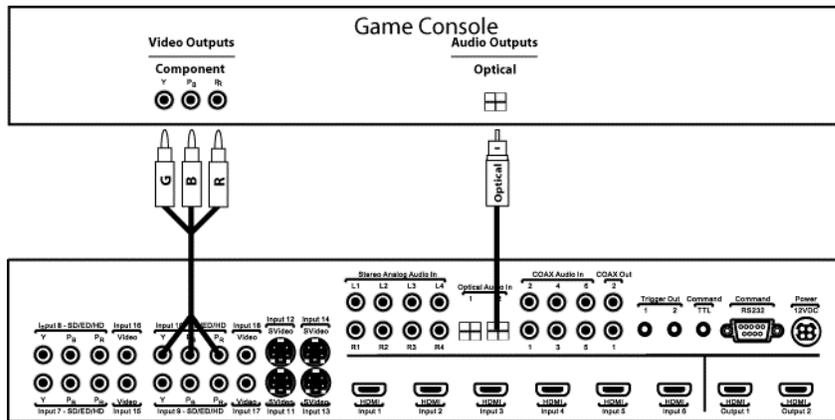


# Section 3 - Setup

## HD-STB / dVHS / HD-DVD / Blu-ray

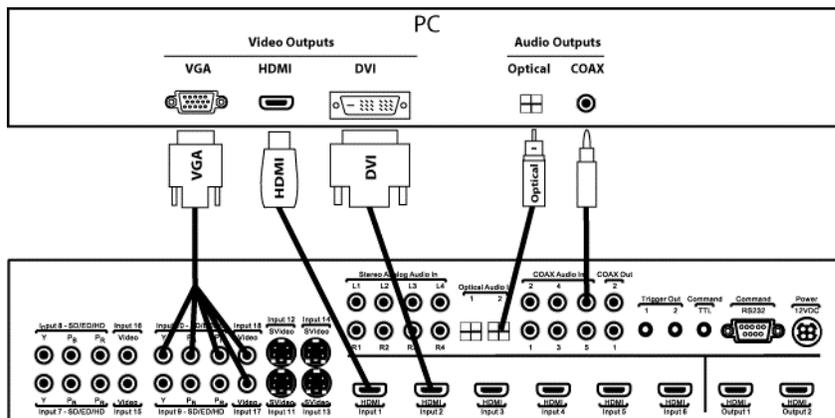


## Game Console



## PC

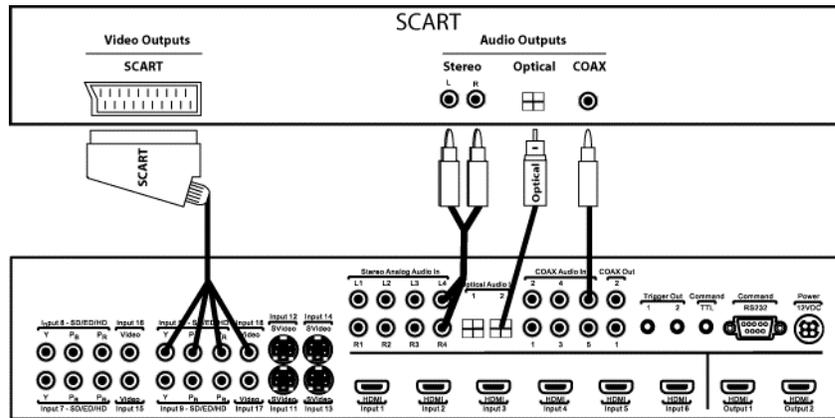
Connecting a PC using a DVI to HDMI cable is preferred, but Input 10 can be used as an analog VGA (RGBHV) input. Use the Y channel for green, the P<sub>R</sub> channel for red and the P<sub>B</sub> channel for blue, Input 17 for VSync, and Input 18 for HSync.



## Section 3 - Setup

### SCART (RGBcvS)

Note: For RGBcvS, a component input is combined with the adjacent composite video input (e.g. component Input 10 + cvS on Input 18).



### System Hook-up Steps

#### STEP 1 – Connecting the Radiance outputs

1. The Radiance has two HDMI outputs that can be used to drive displays and/or amplifiers that have an HDMI input connector. DVI displays are compatible with HDMI and can be connected using an HDMI-to-DVI cable. Lumagen recommends against using an HDMI-to-DVI adaptor for this connection, as this extra connection has been known to compromise the video data.
2. Use an HDMI, or HDMI-to-DVI, cable to connect to the display input, as appropriate.
3. Use an HDMI cable, or coax cable to connect to the amplifier input, as appropriate.

#### STEP 2 – Connecting your sources to the Radiance

1. Use the appropriate cables to connect the video and audio outputs of your sources to the appropriate inputs on the Radiance.

#### STEP 3 – Powering up your Radiance

1. Plug the DC power cable, from the external power supply, into the 12 VDC power connector on the back of the Radiance. **Note: Use only the Lumagen power supply.**
2. Plug the removable AC power cord into the connector on the external power supply.
3. Plug the AC power cord into a power outlet. (100-240V at ~50/60Hz)
4. The LED on the front panel of the Radiance will light up with a red color.
5. To turn on the Radiance, press the "ON" button on the remote.
6. The LED on the front panel of the Radiance will change to a green color.

## Section 3 - Setup

### STEP 4 – Set the output on your Radiance

1. The Radiance automatically detects the optimal output resolution for HDMI and DVI displays. If you prefer to manually select the output resolution, a specific output resolution can be selected using the menu or by direct command.

Menu command: **MENU** ® **Output** ® **Configs** ® **Config0** ® **Select Mode**

Direct command:

480p: **MENU 021**    540p: **MENU 022**    600p: **MENU 023**  
720p: **MENU 024**    768p: **MENU 025**    840p: **MENU 026**  
1080p: **MENU 027**    1080i: **MENU 028**  
Other: **MENU 0 3 value** [^,‡] **OK**, (^ is interlaced and ‡ is progressive)

2. Set vertical refresh rate: Skip this step if the output rate is to be 59.94 (U.S.A and some other countries). The default vertical refresh rate is 59.94, but it can be changed to be from 23.98 up to 120 Hertz. The maximum vertical rate is dependent on the output resolution. For example, at 1080p output the maximum vertical rate is 60 Hertz.

Menu command: **MENU** ® **Output** ® **Configs** ® **Config0** ® **Timing**

Direct command: **MENU 04 (50Hz, 60Hz) OK**

### STEP 5 – Select the input on your Radiance

1. Select an active video input by using the numeric keypad on the remote control. For inputs 1 through 9, press the "**Input**" button and then press the corresponding number button on the remote. For inputs 10 through 18, press the "**Input**" button, press the "**+10**" button, then press the corresponding number button on the remote (i.e. For input 11, press "**Input**, **+10**, **1**").

### STEP 6 – Check for an image

1. You should now have an image from your active video source visible on your display.

## Section 4 - Audio

### **Section 4 – Audio**

The RadianceXD supports the HDMI 1.1 audio formats, and the RadianceXE supports the HDMI 1.3 audio formats. This means that the Dolby Digital TrueHD™ and DTS Master-Audio™ are not available in the RadianceXD (HDMI 1.1), but are available for the RadianceXE (HDMI 1.3). Other audio formats are the same in both units.

### **Introduction to the Audio Menu**

The **Audio** menu configures the audio EDID reported back to HDMI sources and is independent of the Video EDID mode. In addition it selectively enables audio outputs based on the specified conditions. Many common system configurations can use the default Audio mode settings. Some examples of these are:

- HDMI television connected to HDMI Out 1
- HDMI receiver connected to HDMI Out 1 with a display connected to the receiver's HDMI output
- HDMI receiver connected to HDMI Out 1 and (non-audio) display connected to HDMI Out 2
- SPDIF receiver connected to COAX Audio Out and (non-audio) display connected to HDMI Out 2

**NOTE:**

***Associating an audio input with a video input is done using the Input menu  
MENU ® Input ® Audio Setup ® Source ® (audio input) ® OK.***

Some important concepts for selecting the audio configuration are:

- Audio from any audio input (HDMI, SPDIF, analog) can be routed to one or both of the HDMI outputs, and/or the two COAX outputs, with the appropriate limits on the output format. For example, the digital COAX audio output can only carry 2-channel PCM, Dolby Digital, and DTS.
- HDMI audio EDID reported back to the HDMI sources can be passed-back from either of the two HDMI outputs, passed back from the common elements of the two outputs (i.e. only features supported by both outputs are enabled), or specified by the user (User EDID).
- The audio EDID reported back to sources can change dynamically, as configured by the user, based on which HDMI output has active video. **NOTE:** Some sources update their EDID information only when they are powered on, or do not properly reread EDID when the HDMI Hotplug signal is toggled. If you have a source that reads EDID only at power-on, or does not respond properly to Hotplug, a single EDID mode should be enabled (e.g. select "always report user EDID" as described below).
- Selecting "User EDID" is the recommended practice, when appropriate. This allows the Radiance to report the EDID back to the HDMI sources even when the display or receiver is turned off. This can also significantly shorten the system boot time.
- Default "User EDID" mode is 2-channel PCM and Dolby-Digital 5.1 only. The user can change the "User EDID" to include any audio modes supported by the Radiance and the audio processor.
- Audio EDID, and audio output enables, are global parameters. That is, they change (only) when the active output changes. **NOTE:** The Audio EDID mode is independent of the Video EDID mode.
- You can over-ride the global Audio EDID for a particular HDMI input by selecting *MENU ® Input ® Audio Setup ® Audio EDID ® Custom ® Ok. Set the audio modes to "Y" (yes) that you want to advertize for this input.*
- Audio is muted when changes are detected on the input. Some audio receivers need to be muted longer to avoid unintended noise. *MENU ® Input ® Audio Setup ® Mute Control ® Long ® Ok*

### **Audio Menu Navigation**

You can change the setting for any item in the Audio menu by first navigating to the item using the remote's arrow buttons and then pressing the "OK" button. The item will begin flashing to indicate it is active for change. Use the arrow buttons to change the setting. Press the "OK" button to accept the setting or the "EXIT" button to cancel. The highlight will stop flashing and a new item can be selected.

### **Audio Menu Selections**

Each line of the audio menu can have up to 6 entries. These are:

## Section 4 - Audio

Conditional	Audio EDID to Report	User Mode Select	HDMI1	HDMI2	SPDIF	
Always	Merged Out1&Out2 EDID	PCM 2Ch 44.1Khz	Y	On	On	On
If Out1 video on	Out1 EDID	PCM 2Ch 48Khz	Y	Off	Off	Off
If Out2 video on	Out2 EDID	PCM 2Ch 96Khz	Y			
Else	User1 EDID	PCM 5.1 44.1Khz	N			
	User2 EDID	PCM 5.1 48Khz	N			
	User3 EDID	PCM 5.1 96Khz	N			
		DD 5.1Ch	Y			
		DD 7.1Ch	N			
		DTS 5.1Ch	N			
		DTS 7.1Ch	N			
		DD HD 5.1Ch	N			
		DTS HD 5.1Ch	N			

**NOTICE:** “DD HD 5.1 Ch” (Dolby Digital TrueHD™) and “DTS HD 5.1 Ch” (DTS Master-Audio™) are not available in the RadianceXD (HDMI 1.1), but are available for the RadianceXE (HDMI 1.3).

### Audio Menu Structure

Audio setup is global using an “If – Then – Else” structure based on which HDMI output has active video. In contrast, the video EDID is selected in the input memory “EDID Setup” on a “per-input-memory” basis, and the audio EDID is globally selected based on which HDMI output has active video. The net effect of this method is that the video EDID capability can be passed back from one of the HDMI outputs (or user defined) and the audio EDID capability can be passed back from the same HDMI output, the other HDMI output (or user defined).

#### The “If” Conditional

The first parameter on each command line can be an “Always” clause, an “If” conditional, or an “Else” clause. If there is more than one line, the last line will always contain an “Else” clause. The “Always” or “Else” clauses do not have conditionals. There are two options for an “If” conditional:

- If Output 1 is enabled for video output
- If Output 2 is enabled for video output

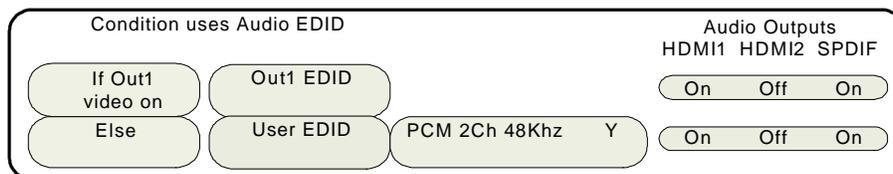
#### The “then” Clause

The second parameter is the “then” clause. If the “If” conditional is true the “Then” clause is used, otherwise control is passed to the next command line. The options are:

- User Defined
- Pass-through audio EDID from Output 1
- Pass-through audio EDID from Output 2
- Pass-through the common audio modes from Output 1 and Output 2

#### Audio Example 1 (Default Audio Configuration)

Output 1 drives a receiver that has audio capability. Output 2 drives a display that doesn’t have audio capability. This is the default case, and can be set as shown:



- If output 1 is enabled for video output, and it’s EDID shows that it has audio capability, then pass it’s audio EDID back to the HDMI sources.
- If this is not true, then set the EDID to the audio formats selected by the user.

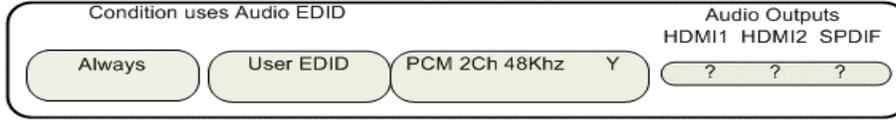
Because an HDMI device should not output audio to a particular output if it is beyond the capability of the device attached to that output, each line has a user selectable field to independently enable each audio output. These fields cover HDMI output 1, HDMI output 2 and the digital COAX audio outputs. So the default case has HDMI output 1 and COAX audio turned on. You should change the settings of the User EDID to match your system.

#### Audio Example 2

## Section 4 - Audio

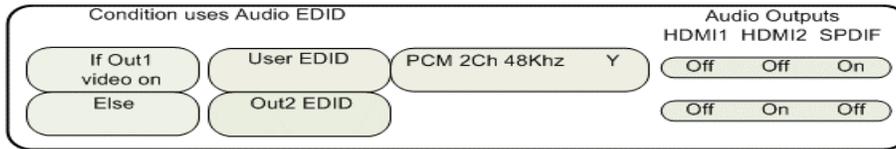
A single line case with “User EDID” is shown below.

When you set the audio EDID to “User EDID,” a “User EDID settings” menu is shown (this is the “PCM 2 Ch 48KHz Y” entry below). You can use the “User EDID settings” menu to select which audio modes will be advertised by the audio EDID. By default 2-channel PCM and DD 5.1 modes are enabled. Other modes must be enabled using the menu commands.



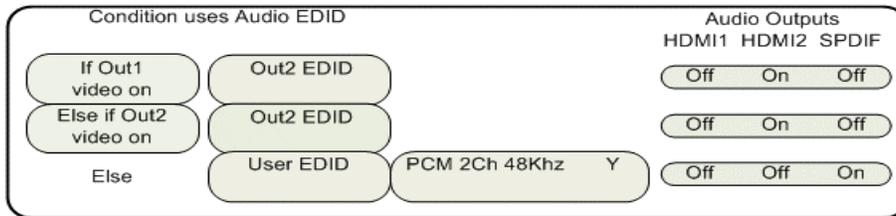
### Audio Example 3

Output 1 drives a projector, which doesn't have audio capability (or it's not used) and instead the COAX audio output is used. Output 2 drives a second display, which has audio capability and uses HDMI audio. When the second output is used, the video configuration is set to enable output2, and disable output 1. This type of setup might have the two displays in different rooms with different equipment. This can be set as:



### Audio Example 4

Output 1 drives a 1080p60 HDMI projector without audio capability, and output 2 drives an HDMI amp. In addition, the amp's HDMI output drives a 720p (max) LCD TV. When watching the projector (1080p60), Output 2 should have audio only since the TV cannot accept 1080p60. When you watch TV you would select 720p video output, and turn on the video output on HDMI Output 2. One option is to set MEMA to output 1080p (and disable output 2 video), and MEMB to output 720p on both outputs. Audio can be set as:



## Audio Source Selection Defaults

To change the audio source for a particular input, first select that video input, and then select the desired audio source. Any number of video inputs can be linked to the same audio source. The command is:

**MENU ® Input ® Audio Setup ® Source ® (select audio input) ® OK**

The video inputs are linked to the following audio sources by default.

Input Number	Video Input Type	Audio source	Input Number	Video Input Type	Audio source
1	HDMI	HDMI1	10	Component	COAX3
2	HDMI	HDMI2	11	S-Video	TOS2
3	HDMI	HDMI3	12	S-Video	COAX4
4	HDMI	HDMI4	13	S-Video	COAX5
5	HDMI	HDMI5	14	S-Video	COAX6
6	HDMI	HDMI6	15	Composite	STEREO1
7	Component	TOS1	16	Composite	STEREO2
8	Component	COAX1	17	Composite	STEREO3
9	Component	COAX2	18	Composite	STEREO4

# Section 5 – Configuration

## Section 5 – Configuration

### Basic Commands

#### Power

Turn power on by pressing the **ON** button. Place the Radiance in standby-mode by pressing **STBY**.

#### Input Selection

The eighteen video inputs are numbered 1 to 18. For inputs 1 through 9, press the **"Input"** button and then press the corresponding number button on the remote. For inputs 10 through 18, press the **"Input"** button, then the **+10** button and then the corresponding number button on the remote (i.e. For input 11, press **"Input, +10, 1"**).

#### NOTE:

**If the menu is not displayed on the screen, inputs 1 through 9 can be selected by just pressing the corresponding number button on the remote.**

If desired, the **"Input"** button can be programmed to display a screen with the inputs listed as a menu-table. Then the desired input can be selected either with the number keys, or by using the arrow keys to highlight the desired input and then pressing the **OK** button. The command to enable the input menu is:

**MENU ® Other ® Menu control® Menu Options ® Input Menu ® (Off, On)**

#### Configuration Memory Selection

Each input has four configuration memories. These are referred to as memory "A," "B," "C," and "D." To select one of the memories press **MEMA**, **MEMB**, **MEMC**, or **MEMD**. Note, RS232 codes are provided to directly access these memories.

Each configuration memory is independent of the other memories. To allow the memories to be used for mode selection (e.g. day/night), the type remains unchanged when a new input is selected. (i.e. If input 2 memory B is active, pressing **"Input, 3"** selects input 3 memory B).

#### Input Aspect Ratio Selection

The input source aspect ratio can be selected by pressing the **4:3**, **LBOX**, **16:9**, **1.85**, or **2.35** button. To use the **NLS** feature, press "4:3, NLS", "16:9, NLS", or "1.85, NLS".

- Use **4:3** for standard definition full-screen material.
- Use **LBOX** for "letterbox" standard definition material, such as analog-television movies shown with black bars above and below the image.
- Use **16:9** for material labeled as "Enhanced for 16:9 televisions".
- Use **1.85** for material labeled as "Aspect ratio 1.85".
- Use **2.35** for material labeled as "Aspect ratio 2.35".
- Use **NLS** to apply a horizontal non-linear stretch, stretch 4:3 to 16:9, stretch 16:9 or 1.85 to 2.35.

#### NOTE:

**Make sure the "display aspect ratio" setting is 16:9 in the setup menu of all video sources (e.g. DVD players or set top boxes), even if your display is not 16:9.**

#### Image Zoom

After the input aspect ratio has been selected, the image can be zoomed in to better fit the screen. The zoom function uses the  $\ddagger$  and  $\wedge$  arrow buttons. When the menu is off, the  $\ddagger$  arrow button zooms in and the  $\wedge$  arrow button zooms out.

#### Info Screen

Pressing **"OK"** when the menu is off, displays an info screen. An example screen is shown below. Note that this will change as other information is added to the "info Screen."

Radiance info Pg 1			
SW Rev.xxxxxx	Serial:xxxxxxxx		
	Input 1A	Out1	Out2
Resolution:	480i	720p	720p
Refresh:	59.94Hz	59.94Hz	59.94Hz
Color Fmt:	YCbCr 422	RGB	RGB
HDCP:	On	On	Off

## Section 5 – Configuration

Pressing “**ALT**” or “**OK**” when the info screen is displayed, displays a second info screen. An example is shown below.

```
Radiance info Pg 2
Audio:HDMI1
In aspect=16:9  Out aspect=1.78  Zoom=0%
X scaler: On  AdjInHres: 1914  OutHRes:720
Y scaler: On  AdjInVres: 1077  OutVRes:480
Genlock: currently off
```

### On-Screen Help

Pressing, “**HELP**” when the menu is displayed, displays on-screen help information for the currently highlighted menu item.

### Quick Keys

If you use a basic universal remote to control the Radiance, you can activate an optional menu that allows you to use the Radiance menu to set input aspect ratio (4:3, LBOX, 16:9, 1.85, 2.35, NLS), set zoom (Zoom+, Zoom-) and select the user memory (MemA, MemB, MemC, MemD). The “Quick Keys” menu duplicates the function of pressing the corresponding buttons on the Lumagen remote.

**MENU** ® **Other** ® **Menu control**® **Menu Options** ® **Quick Keys** ® (**Off, On**)

**MENU** ® **Quick Keys** ® (**4:3, LBOX, 16:9, 1.85, 2.35, NLS, Zoom+, Zoom-, MemA, MemB, MemC, MemD**)

## Basic Output Setup Commands

### Connections

Connect the video cables. Then connect the power adaptor and turn on all required components.

### Digital Display

For a digital display, the Radiance will automatically detect whether the display has a DVI or a HDMI input.

### Analog Display

For an analog display, attach an external HDMI, or DVI, to analog output converter.

### Set Vertical Refresh Rate

Skip this step if the output rate is to be 59.94 (U.S.A and some other countries). The default vertical refresh rate is 59.94, but it can be changed to be from 23.98 up to 120 Hertz. The maximum rate varies depending on the resolution. Up to eight different output configurations can be available for additional flexibility. For example, the Radiance can be set to output 50 Hertz for PAL sources and 59.94 Hertz for NTSC sources.

**MENU 0 4 (50Hz, 60Hz) OK**

### Set Output Resolution

The output resolution defaults to 480p, with 480 active scan lines in progressive format. A different output resolution can be selected using the menu or by direct command. The menu command is:

**MENU** ® **Output** ® **Configs**® [**Config**] ® **Select Mode** ® **OK**

The direct commands to select output resolution are:

480p: <b>MENU 0 2 1 OK</b>	540p: <b>MENU 0 2 2 OK</b>	600p: <b>MENU 0 2 3 OK</b>
720p: <b>MENU 0 2 4 OK</b>	768p: <b>MENU 0 2 5 OK</b>	840p: <b>MENU 0 2 6 OK</b>
1080p: <b>MENU 0 2 7 OK</b>	1080i: <b>MENU 0 2 8 OK</b>	

### Pixel Perfect

For digital displays using the DVI-D or HDMI input (skip this step for displays using an analog input), it is important to operate the display at their native resolution to achieve a “pixel-perfect” image. This maximizes the Lumagen’s video processing advantages by disabling the display’s internal scaling. Some displays do not support their native

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resolution as an input, or do not operate in “pixel-perfect” mode even when they are driven at their native resolution. Consult with the display’s manufacturer for more information on if the display can achieve a pixel-perfect image.

Some DVI-D/HDMI displays can achieve a “pixel-perfect” image, but require specific pixel timings for all parameters, not just active pixel counts. Lumagen video processors can accommodate these displays using the Timing command. The command is:

**MENU ® Output ® Configs ® [Config] ® Timing ® OK**

### Set Aspect Ratio

Set the output aspect ratio to match the screen. Skip this step if the screen aspect ratio is 16:9 (the default). The default “Single output aspect” mode is appropriate for most systems. You might choose the “Output aspect per input aspect” mode if you have a projector that has a movable anamorphic lens.

**MENU ® Output ® Configs ® [Config] ® Aspect Ratio ® (Single output aspect, Output aspect per input aspect) ® xxx ® Ok**

### Set Output Format

Set the output format and level. If a display supports YCbCr 4:2:2, that is the optimal mode to use. For RGB format it is important to match the display’s levels requirements (video or PC). Selecting video level for RGB format is safer since most displays can be adjusted for black-level and contrast properly. You can test if PC mode works by selecting PC mode and then selecting the Lumagen Contrast Test Pattern. If the 4 IRE bar is visible versus the black background the display can accept PC level. The command is:

**MENU ® Output ® Configs ® [Config] ® HDMI Format ® Type ® (YCbCr422, YCbCr444, RGB-PC level, RGB-Video level)**

## Basic Input Setup Commands

### Select Input Type For Component Inputs

Select the input type for the component/RGB inputs 7 through 10. Skip this step if the input type is component and if they use the correct color-space. Note SDsignals on the component inputs always use the SD color space. The SD/HD selection for YPbPr only applies to HD input resolutions. Select desired input, then press

**MENU ® Input ® Analog Setup ® Type®(Component, RGBHV, RGsB, RGBS, SCART)**

### Set Video Input Level

Set the video input level. Skip this step if using HDMI inputs using either 4:2:2 or 4:4:4 color format since these are always video level. The command is:

**MENU → Input → [HDMI Setup, Analog Setup] → Level → (Video, PC)**

## Output Configuration Commands

The factory-default output settings are 480p at 59.94 Hertz, with a 1.78 (16:9) aspect ratio.

### Vertical Output Resolution - Presets

Select one of the preset output modes from a list. The only interlaced format supported is 1080i. If after selecting you lose the picture press Exit or wait 15 seconds for display mode to revert to the previous mode. There are 2 automatic modes that get data from the display about its preferred mode. Select which output gets priority by choosing either auto\_p1 or auto\_p2. The command is:

**MENU ® Output ® Configs® [Config] ® Select Mode ® OK**

The direct commands to select output resolution are:

480p: <b>MENU 0 2 1 OK</b>	540p: <b>MENU 0 2 2 OK</b>	600p: <b>MENU 0 2 3 OK</b>
720p: <b>MENU 0 2 4 OK</b>	768p: <b>MENU 0 2 5 OK</b>	840p: <b>MENU 0 2 6 OK</b>
1080p: <b>MENU 0 2 7 OK</b>	1080i: <b>MENU 0 2 8 OK</b>	

### Exact Output Timing

Modify the timing parameters of the output mode. The command is:

**MENU ® Output ® Configs ® [Config] ® Timing ® Mode Timing**

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### Rate Match

Some material may be sourced at 24.0/48.0/60.0 Hz refresh rates instead of the usual 23.98/47.95/59.94 Hz rates. In these cases it is desirable to slightly alter the output rate as long as your display works with the slightly different rate. Set it to the default setting of 'Off' if your display will not take a slightly altered rate. The command is:

**MENU ® Output ® Configs ® [Config] ® Timing ® Rate Match ® (On, Off)**

### Screen Aspect Ratio

Select the screen aspect ratio. The screen aspect ratio range is 1.33 (4:3) to 2.50 and is entered in units of hundredths (e.g. 16:9 is entered as **1 7 8**). If you have a normal fixed aspect display, select the (default setting) "Single output aspect". If you have a movable anamorphic lens, select "Output aspect per input aspect". There is a special case when you use NLS input aspect with "Output aspect per input aspect". When the input aspect is 4.3+NLS the output aspect assigned to the 16:9 entry is used. When the input aspect is LBOX+NLS, 16:9+NLS, or 1.85+NLS the output aspect assigned to the 2.35 entry is used. The command is:

**MENU 0 6 (Single output aspect, Output aspect per input aspect) OK xxx OK**  
or **MENU ® Output ® Configs ® [Config] ® Aspect Ratio ® (Single output aspect, Output aspect per input aspect) ® Ok ® xxx ® Ok**

### Graybar Intensity

#### NOTE:

**Consult a home theater specialist for assistance setting the graybar intensity.**

Some degree of burn-in will occur on any susceptible display, but this command can help minimize it by allowing the intensity of the graybars to be adjusted. The command is:

**MENU ® Output ® Configs ® [Config] ® Other ® Graybar ® (Sides, Top/bottom)**

### Output Type

You can specify the black pedestal as "RGB-PC level" (0 IRE) or "RGB-Video level" (7.5 IRE). "YCbCr 422" and "YCbCr 444" are video level (7.5 IRE). For the HDMI output, setting the level as *video* allows blacker-than-black and whiter-than-white. Setting the level as *PC* allows full-range black to white. The command is:

**MENU ® Output ® Configs ® [Config] ® HDMI Format ® Type ® (VCbCr422, VCbCr444, RGB-PC level, RGB-Video level)**

### Dither

Some fixed pixel displays show contouring on images that have gradients because the actual resolution of the each pixel is less than 8-bits. The dither control can be used to enhance the resolution of the display and reduce contouring. Dither position sets the bit size of the pixel for dithering. Orientation controls the frame-to-frame randomization and can be fixed or dynamic. Masking can be turned on to clear the lowest bits after the dither position. The command is:

**MENU ® Output ® Configs ® [Config] ® HDMI Format ® Dither**

### Mask and Shrink

The "mask" command allows you to "blank" the edges of the video image on the output without changing its position or size. The gray level of the mask is adjustable from black to white in sixteen steps. The "shrink" command allows you to adjust the image size to fit inside a screen masking system. The command is:

**MENU ® Output ® Configs ® [Config] ® Mask/Shrink ® (Mask, Shrink)**

### Gamma Factor

The Gamma Factor adjusts the gamma of the video output up or down. The default value of 1.00 leaves gamma unchanged. The command is:

**MENU ® Output ® Configs ® [Config] ® Color Mgmt ® Gamma Factor ® OK**

### Copy Output Settings

This command copies the current output configuration to the selected output configuration or configurations. You can choose whether to copy the mode settings, shrink settings, aspect settings, color management settings and other settings. The command is:

**MENU ® Output ® Copy® OK**

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### Input Configuration Commands

After the output is configured, calibrated, and saved, calibrate one input. Then copy that configuration to all the other configuration memories. Then calibrate for differences in the other inputs. To program one of the independent input memories, select the input, then select the configuration memory and use the menu to configure the input. For example, if memory *A* been calibrated and a second configuration is needed, start by copying Memory *A* to memory *B* for that input to reduce setup time for the second configuration.

#### HDMI Input Setup

Inputs 1, 2, 3, 4, 5 and 6 are HDMI. By default the appropriate color space is automatically selected (“Auto” mode) for standard-definition “Bt.601” or high-definition “Bt.709.” The “Auto” mode is generally best, but some upscaling sources do not convert the color format to Bt.709 as they should and so “Bt.601” would be manually selected for these if they are programmed to output HD formats. The command is:

**MENU ® Input ® Video Setup ® [Resolution] ® Picture ® Color Format ® OK**

#### HDMI Video Type

By default the HDMI input format is detected automatically. For DVI sources that do not report their format, the input format can be selected manually. The command is:

**MENU ® Input ® HDMI Setup ® Type ® (Auto, YCbCr 444, YCbCr 422, RGB)**

#### HDMI Physical Input

If desired the input selection for HDMI sources can be assigned to different physical HDMI inputs. This can be useful if a receiver or HDMI switcher is used to switch several HDMI to a single input on the Radiance. Different settings and calibrations for several virtual HDMI inputs can be stored for the same physical HDMI input. The command is:

**MENU ® Input ® HDMI Setup ® Physical In ® (1, 2, 3, 4, 5, 6)**

#### Component/RGBHV/Scart Input Setup

The source type must be programmed for inputs 7, 8, 9 and 10 if the input format is not component video. Select the input and then program its format. The command format is:

**MENU ® Input ® Analog Setup ® Type ® (Component, RGBHV, RGsB, RGBs, Scart)**

The A2D setting adjusts the component input gain based on different Hsync levels. An incorrect setting can give white crush or a low white level. Some video games have too high a white level, which results in white crush. Set this control to “Reduced” to correct the white level. The command is:

**MENU ® Input ® Analog Setup ® A2D Gain ® (Normal, Reduced)**

For HD inputs, you can select the color-space as “Auto,” standard-definition “Bt.601,” or high-definition “Bt.709.” The “Auto” mode is generally best, but some upscaling sources do not convert the color format to “Bt.709” as they should. In this case “Bt.601” should be selected. The command is:

**MENU ® Input ® Video Setup ® [Resolution] ® Picture ® Color Format ® OK**

#### SVideo Input Type

Inputs 11, 12, 13 and 14 are SVideo. These inputs are always set to SD color space (Bt.601).

#### Composite Input Type

Inputs 15, 16, 17 and 18 are Composite video. These inputs are always set to SD color space (Bt.601).

#### Selecting an Output Configuration for an Input Memory

Each input memory uses one of the eight output configurations. For HD capable inputs, each memory has eight resolution “sub-memories” which are set to default values of (480, 576, 720p60, 1080i50, 1080i60, 1080p24, 1080p60 and Other). The “Other” sub-memory is used for any input resolution that isn’t caught by the first seven sub-memories. By default all eight sub-memories are set to output configuration 0. The output-configuration number for each sub-memory can be set independently. Any sub-memory output configuration selection can be updated independent of which input sub-memory is currently active. It is recommended that you turn off video on any output that isn’t using video.

First select the desired input resolution sub-memory. Then select the desired output configuration for HDMI Output1 or select “Video Off”. If you only want audio on HDMI Output1, it can be useful to select “Video Off”. The command is:

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### **MENU® Input® Video Setup® [resolution]® Out1 Select® OK**

For HDMI Output2 elect the output configuration to be a "Copy of Output1" or "Video Off". If you only want audio on HDMI Output2, it can be useful to select "Video Off". If HDMI Output1 video is off an output configuration can be selected for HDMI Output2. The command is:

### **MENU® Input® Video Setup® [resolution]® Out2 Select® OK**

### **HDMI input EDID Display Information**

EDID is information that can be read over DVI/ HDMI cables to influence how source devices send video over the cable and this can then result in a better picture. Enabling this feature does not guarantee the source will use the EDID. There are 4 settings for the Lumagen EDID interface. The Default setting enables all of the display modes currently available. The User defined setting allows the user to individually select which capabilities will be advertised to the connected source. You can scroll through the list of capabilities with the up/down arrows and toggle advertising the feature with the left/right arrows. With the Passback setting the Lumagen will read the EDID from the display and pass that back to the source. Press "ok" when done.

#### **NOTE:**

**Lumagen recommends using Default video EDID or User defined Video EDID. This enables the Radiance to report video EDID back to the sources even when the Display is off.**

#### **NOTE:**

**After you change the EDID information, some sources require you to cycle power for the source or unplug the HDMI cable to get the source to re-read the EDID.**

The command is:

### **MENU® Input® HDMI Setup® Video EDID® (Default, User defined, Passback Out2, Passback Out1)**

### **HDMI input hotplug mode**

#### **NOTE:**

**Do not set Hotplug to "always on" unless necessary since this eliminates the ability of the Radiance to inform the source of a change in the EDID data.**

Hotplug alerts a DVI/HDMI device to downstream a/v changes by toggling. For some devices, such as a PC, it may be necessary to keep hotplug high at all times. The hotplug signal is part of a HDMI/DVI interface. The Radiance provides 2 hotplug settings, "Normal" and "Always On". The "Normal" behavior is to toggle hotplug for the HDMI inputs when the EDID information has been updated. The source is supposed to then read the EDID and make any necessary changes. If the source changes things in response to this new EDID it may restart HDCP, which can sometimes result in losing the video momentarily. If the device connected to the Radiance output toggles the hotplug to the Radiance then there may be some new EDID information to passback to the sources and, if hotplug is set to "Normal", hotplug on all the inputs may get toggled.

Some sources like PC's just stop sending video on HDMI/DVI, and/or go into sleep mode, when the hotplug signal is not asserted, so setting hotplug on the Radiance to "Always On" is a solution.

Sometimes the connectivity of a system can cause a "hotplug loop"---an example would be connecting the Radiance output to an audio receiver and then hooking the monitor output of the receiver to one of the Radiances' inputs. So you can see, if the Radiance toggles its input to the audio receiver, the receiver would check our EDID and then toggle its hotplug back to the Radiance to inform it about this new EDID. The receiver has no idea that the Radiance started it. This could just keep going on, so again setting the Radiance input that's connected to the monitor output from the receiver to "Always On" would stop this hotplug loop from occurring.

### **MENU® Input® HDMI Setup® Hotplug mode® (Normal, Always On)**

### **Auto Aspect**

For HDMI sources (not DVI), aspect information may be sent from the source. Enabling Auto Aspect allows the source to set the input aspect ratio. You can set NLS (non-linear stretch) in order to stretch the width to fill the screen depending on input and output aspects. When manually overriding the auto-aspect the sticky setting will override the auto setting until a 'user memory' button or an 'Input' button is pressed. If 'sticky' is set to off then a new aspect from the source will change the input aspect. The command is:

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### MENU® Input® HDMI Setup® Auto Aspect® (On, Off)

#### Copy Input Settings

Copy the input settings between memories. Applicable input settings can be copied between inputs. Some settings such as audio source are not copied. Other settings are only copied if it makes sense. i.e. a HDMI input type wouldn't be copied to a component input. Copying the first input memory calibrated to other input memories can speed up the calibration process. Note that copying a SD input to a HD input, copies the SD memory to (only) the SD sub-memory of the HD input. The HD sub-memories for the other resolutions are not changed. Copying a HD input memory to a SD input memory copies the SD sub-memory of the HD input to the SD memory. Copying a HD input memory to another HD input memory copies each resolution sub-memory to the respective resolution sub-memory of the other HD input. The input copy command copies all user memory parameters to another input or user memory. The command is:

**MENU® Input® Copy® OK**

#### Saving the Configuration

##### Save

##### NOTE:

**If a Save command is not executed after making changes, the changes will be lost when the unit is put into standby power mode, or if power is interrupted.**

Permanently save the current configuration. Note that, once saved, the configuration is retained even if the unit is disconnected from power. The configuration from the previous save is retained to allow one level of save-undo. You can use the Radiance Configuration Utility to store a configuration file on your PC. The command is:

**MENU® Save® Save® OK**

##### Undo

Revert to the configuration over-written by the last Save command. Repeating the Save Undo command toggles between the last two saved configurations. The command is:

**MENU® Save® Undo® OK**

##### Restore ISF calibration

During calibration, the video technician can save the resulting Lumagen configuration to a special hidden configuration memory. This command restores that configuration in the event that the user inadvertently changes the configuration. A **Save** is required to make the restore permanent. The command is:

**MENU® Save® Restore ISF® OK**

##### Revert To Factory Settings

Set all parameters to factory defaults. A **SAVE** is required to make the settings permanent. The command is:

**MENU 0 9 9 9**

Or **MENU® Save® FactoryReset® OK**

#### Input Picture Controls

##### Black and White Levels

To set the black-level (also referred to as brightness) and white-level (also referred to as contrast) using the Lumagen controls; use a test pattern generator or select the needle pattern in *AVIA (Advanced AVIA® Video Test Patterns® Gray Scale & Levels® Black and White Levels® Needle Pulses)*. Follow the instructions on the AVIA disk. Note the input memory black and contrast are intended to compensate for variations in video source output levels. The Display black and contrast should be calibrated using the Lumagen contrast pattern and the displays brightness and contrast controls. The command is:

**MENU® Input® Video Setup® [Resolution]® Picture® (Black, White)**

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### Color Format

Set the colorspace to match the source. Normally Bt.601 is used for SD/ED modes and Bt.709 is used for HD modes. For RGB sources use Auto. The command is:

**MENU** ® **Input** ® **Video Setup** ® **[Resolution]** ® **Picture** ® **Color Format** ® **(Auto, Bt.601, Bt.709)**

### Color and Hue

**NOTE: Set the display's Color and Hue to their default values.**

Use a test pattern generator or the *Advanced AVIA*® color test pattern to set Color and Hue (**Advanced AVIA**® **Video Test Patterns**® **Color**). Follow instructions on the AVIA disc. Calibrate using the blue color bars and blue filter (**Color Offset** and **Hue Offset**). Then calibrate using the red color bar image and red filter (**Color Red** and **Hue Red**), and then the green color bar image and green filter (**Color Green** and **Hue Green**). Normally not used if the Color-Gamut is calibrated using the Radiance CMS system.

The command is:

**MENU** ® **Input** ® **Video Setup** ® **[Resolution]** ® **Picture**® **ColorDecoder**®  
**(Color Offset, Hue Offset, Color Red, Hue Red, Color Green, Hue Green)**

### Y/C Delay

Adjust the horizontal Chroma timing in relation to Luma. It is suggested that you use the Y/C-delay calibration image from the *Special Tests* section of *Advanced AVIA*, to calibrate the Y/C-delay for SD sources or a test pattern generator. The C<sub>B</sub> and C<sub>R</sub> channels are adjusted independently. The command is:

**MENU** ® **Input** ® **Video Setup** ® **[Resolution]** ® **Picture** ® **YC Delay** ® **(Cr, Cb)**

## Input Size Controls

### Scale Bias

Scaling is normally on in order to adjust the source to exactly fit the output resolution. If the bias is set to "On", scaling is enabled unless the input and output resolution match exactly. If the scale bias is set to "Off" scaling is disabled if the input and output resolutions are close. Scaling is disabled/enabled independently for horizontal and vertical. When the bias is off there can be small borders on the edges of the image. The second page of on-screen status information indicates whether scaling is enabled.

**MENU** ® **Input** ® **Video Setup** ® **[Resolution]** ® **Size** ® **[Aspect ratio]** ® **Scale Bias** ® **OK**

### Input Sizing

Input sizing can be used to compensate for active image size differences in the source. Note: The input size command does **not** affect the output size or position. Rather, it affects which input pixels are captured for processing.

Use the **Crop TopLeft** command to select the top-left-most active input pixel. Use the **Crop BotRight** command to select the bottom-right-most active pixel. For standard-definition sources you should set these controls so that overscan is about 1.5% on all four sides. For digital high-definition sources, overscan may not be required. Cable and Satellite Boxes may require more overscan. Select the scanline using the ‡ and ^ arrows, and the pixel using the ... and † arrows. The command is:

**MENU** ® **Input** ® **Video Setup** ® **[Resolution]** ® **Size** ® **[Aspect ratio]** ® **(Crop TopLeft, Crop BotRight)**

### Vertical Shift

The vertical shift is an easy way to move the image up and down without touching the cropping settings. There are 15 vertical settings that are shared between the input memories. The command is:

**MENU** ® **Input** ® **Video Setup** ® **[Resolution]** ® **Size** ® **[Aspect ratio]** ® **Vert Shift** ® **OK**

### Non-linear Stretch

Non-linear-stretch (NLS) is used to horizontally stretch a 4:3 aspect ratio source to fit a 16:9 aspect-ratio display or to stretch a 16:9/1.85 source to fit a 2.35 aspect-ratio display. The image is stretched by a constant amount in the center and by an increasing amount approaching the left and right edges. This eliminates the black sidebars normally seen when viewing lower aspect material on a higher aspect display. To use non-linear stretch press the "4:3", "16:9" or "1.85" button and then press the "NLS" button.

The goal is to stretch the image to fill the screen in a way that looks as natural as possible. The Lumagen NLS command is very flexible and allows the image to be adjusted to user preferences to achieve this goal. The NLS adjustments are center width, center stretch, top cropping and bottom cropping. The center section of the image

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is stretched by a constant ratio from 100% to 124%. The width of the center section can be set from 15% to 70% of the display width. By programming the center section width and stretch amount, the amount of non-linear stretch in the left and right sections can be optimized. In addition, the top and bottom cropping can be set from 0 to 12%. Increasing the amount of cropping reduces the amount of stretch near the left and right edges of the image. When setting the cropping parameters, it is recommended that the satellite/cable box menu be checked to assure that critical parameters remain visible.

Some 4:3 sources fill the entire source image (e.g. DVD 16:9 movies), but other sources place a 4:3 image in the center of a 16:9 image (e.g. HDTV with up-scaled SD source). This latter case is seen as a “pillar-boxed” image with black bars on the left and right. The “PILLARBOXED” parameter must be enabled for this case. The Lumagen will then crop the pillbox bars and stretch the active 4:3 image.

For a 16:9 display, when NLS is enabled, the image will fill the screen with a 4:3 (1.33) source for any output aspect ratio up to 1.85. If the output aspect ratio is greater than 1.85, software limits the maximum width to the equivalent of 1.78 and adds left and right sidebars.

For a 2.35 display, when NLS is enabled, the image will fill the screen with a 16:9 or 1.85 source for any output aspect ratio up to 2.40. If the output aspect ratio is greater than 2.40, software limits the maximum width to the equivalent of 2.40 and adds left and right sidebars.

Select the parameter to adjust using the † and ^ arrows, and change the value of the selected parameter using the ... and † arrows. The command is:

**MENU ® Input ® Video Setup ® [Resolution] ® Size ® [Aspect] ® NLStretch ® OK**

### Input Masking

The masking command allows you to cover up the sides of the video source. It is different than cropping in that the video is not stretched to fill the screen. It can be useful for pass-through modes where you do not wish the video processor to scale the picture but there is some video noise on side(s) of the picture you wish to cover up. Another situation may be that you wish to cover up and change the gray level of the black bars added by a video source, surrounding a letterboxed image.

When you select the command you must first select which mask # you wish to use. There are 15 available masks. They can be shared among different input memories. After selecting the MASK # you then can adjust how much the mask covers of the 4 sides of the input. The last step is to alter the gray level for the 4 sides. If an input mask is on, it's gray level takes precedence over the gray level of the aspect bar. The aspect bar gray level can be adjusted under Output->Configs->[Config]->Other->Graybar. Also, if aspect bars are requested (via differing input and output aspects) the masking is added to the aspect bar width. The command is:

**MENU ® Input ® Video Setup ® [Resolution] ® Size ® [Aspect ratio] ® Masking ® OK**

### Input Enhancement Controls

#### Sharpness

This command is used to adjust the sharpness for all inputs. There are controls for horizontal, vertical and diagonal sharpness (edges) and texture (fine detail). It is generally best to leave these controls at the default setting of 0 or to use moderate settings. Using higher settings can introduce image artifacts. Some people prefer having all 6 settings set the same. Other people prefer only using the diagonal parameters. The command is:

**MENU ® Input ® Video Setup ® [Resolution] ® Enhance ® Sharpness ® OK**

#### Noise Reduction

2D/3D noise is noise within a single video frame as well as noise between video frames (aka temporal noise). Mosquito noise and block artifact noise are both seen in compressed material. Block artifact reduction is useful for overly compressed video. The command is:

**MENU ® Input ® Video Setup ® [Resolution] ® Enhance ® Noise Red. ® OK**

#### Adaptive Contrast

Adaptive Contrast varies the contrast based on the average level of the central 60% of the picture. When you adjust the contrast the effect is shown in a centered window for evaluation. The command format is:

**MENU ® Input ® Video Setup ® [Resolution] ® Enhance ® AdapContrast ® OK**

#### Copy Enhancement Settings

You can copy the local enhancement settings to other resolutions and memories. The command is:

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**MENU** ® **Input** ® **Video Setup** ® **[Resolution]** ® **Enhance** ® **Copy** ® **OK**

### Miscellaneous Input Controls

#### Deinterlacing Mode

The default deinterlacing mode is “Auto.” This mode automatically switches between video and film deinterlacing and is best for mixed-mode sources that change between video and film. For sources that are known to be interlaced-video, choosing “Video” deinterlacing mode can improve image quality. For sources that are known to be film sources, choosing ‘Film’ deinterlacing mode can improve image quality. For 60Hz interlaced film sources the output must be one of 24, 48, 60, or 72 Hertz, and for 50Hz interlaced sources the output rate must be 50 Hertz. For “Film” mode, Sharpness, Noise Reduction and Adaptive Contrast settings are not available. The command is:

**MENU** ® **Input** ® **Video Setup** ® **[Resolution]** ® **Control** ® **Deint** ® **Mode** ® **(Auto,Video,Film)**

#### Inter Frame Motion Detection (IFMD)

For deinterlacing video sources (not applicable for film) the IFDM control trades-off between minimizing combing artifacts (small values) versus maximizing detail (larger values) using the IFMD setting. The default setting is 6. This control is most effective with “Video” deinterlacing mode. The command is:

**MENU** ® **Input** ® **Video Setup** ® **[Resolution]** ® **Control** ® **Deint** ® **IFMD** ® **(0-15)**

#### Game Mode

To minimize video processing latency when playing video games, turn “Game Mode” on. Typically game mode is enabled for a specific input memory that is then selected while playing games. For games that have a vertical rate that matches the Radiance output vertical rate, turning “Genlock” on can further minimize video latency. Game mode is not intended for video/film program material, such as television shows. The command is:

**MENU** ® **Input** ® **Video Setup** ® **[Resolution]** ® **Control** ® **Game Mode** ® **(On, Off)**

#### Genlock

Genlock is used to minimize video delay, for 480i/1080i to 24Hz conversion, and to avoid an occasional dropped or doubled frame. It can slow down getting a picture when the source changes modes so you might want to leave it disabled for some sources. The command is:

**MENU** ® **Input** ® **Video Setup** ® **[Resolution]** ® **Control** ® **Genlock** ® **(Auto, Disabled)**

#### Deinterlacing Field Flip

Some source devices do not follow conventions for the order of video fields. This can be seen as excessive combing in the video. While generally not required, this command allows the input fields to be swapped so these out-of-spec sources can be properly deinterlaced. The command is:

**MENU** ® **Input** ® **Video Setup** ® **[Resolution]** ® **Control** ® **Deint** ® **Field** ® **(On, Off)**

#### Input Level

This command specifies if an analog input has a black pedestal, and if DVI inputs use video levels or PC levels. If you are unsure, it is better to leave these at 0 IRE for analog, or PC level for HDMI.

**MENU** ® **Input** ® **(HDMI Setup, Analog Setup)** ® **Level** ® **(Video, PC)**

#### Input Label

Each input configuration memory can be named. Follow the on-screen directions. The ... and † arrows select which input to change and then which character to change. The ‡ and ^ arrows change the selected character. The command is:

**MENU** ® **Input** ® **Label** ® **OK**

#### Copy Input Settings

Copy the input setup from the active memory, to the selected memory, or memories. Copying the first input memory calibrated to other input memories can speed up the calibration process. Note that copying a SD input to a HD input, copies the SD memory to (only) the SD sub-memory of the HD input. The sub-memories for the other resolutions are not changed. Copying a HD input memory to a SD input memory copies the SD sub-memory of the HD input to the SD memory. Copying a HD input memory to another HD input memory copies each resolution sub-memory to the respective resolution sub-memory of the other HD input. The input copy command copies all user memory parameters to another input or user memory. The command is:

**MENU** ® **Input** ® **Copy** ® **OK**

## Section 5 – Configuration

### System Settings

#### Menu Mode

The menu mode controls what settings can be changed in the menu. In Locked mode nothing can be changed in User Mode, Service Mode (temporary) and Service Mode (permanent). The default setting is User Mode, which allows access to all the basic controls. The Service Mode allows access to all controls including the color gamut controls. The configuration can be locked to prevent unintended changes. When locked, input selection functions normally, but setup parameters are fixed. The command is:

**MENU ® Other ® Menu control® Menu Mode ® (Locked, User mode, Service mode temporary, Service mode permanent)**

#### Menu Timeout

In the "Normal" setting the menu will timeout in approximately three minutes. The "Slow" setting extends the menu timeout by x10. This also controls the length of time test patters are displayed. The command is:

**MENU 0 9 0 5 (Normal, Slow) Ok**

or **MENU ® Other ® Menu control® Menu timeout ® (Normal, Slow)**

#### OSD Enable

Enable or disable On-Screen-Display (OSD) activation after user commands. If enabled, the OSD shows the selected input, input aspect ratio, and zoom. The command is:

**MENU ® Other ® Menu control® OSD enable ® (On, Off)**

#### Input Reselect

If this is set to "On", then when the currently active input is reselected the input will be reinitialized and the input number will be displayed. The command is:

**MENU ® Other ® Menu control® In Reselect ® (On, Off)**

#### Quick Keys

This adds an optional top-level menu called "Quick Keys" that gives access to functions that are normally selected using buttons on the Lumagen remote. This menu can be used with programmable remotes that have limited buttons. You can use the arrow buttons on the remote to highlight one of the functions and press "Ok" to execute the function. Alternately you can use a number button on the remote to highlight one of the functions and then press "Ok" to execute the function. (0)4:3, (1)LBOX, (2)16:9, (3)1.85, (4)2.35, (5)NLS), (6)Zoom+, (7)Zoom-, (8)MemA, (9)MemB, (n/a)MemC, (n/a)MemD) The command is:

**MENU ® Other ® Menu control® Menu Options ® Quick Keys ® (On, Off)**

**MENU ® Quick Keys <optional top-level menu>**

#### Menu Placement

In the "Standard" placement the menu is in the center of the screen. Choose "Center open" to move the menu so that the center of the screen is open for display calibration measurements. The command is:

**MENU ® Other ® Menu control® OSD enable ® Menu placement ® (Standard, Center open)**

#### Initial Power State

When power is first connected, the unit can be set to turn on automatically, or it can be set to start in standby-mode. The command is:

**MENU ® Other ® OnOff Setup ® Auto On ® (Standby, Turn On)**

#### Initial Input State

This sets which input memory is selected when unit is turned on after power has been removed or the unit has been put into standby. The command is:

**MENU ® Other ® OnOff Setup ® Input Select**

## Section 5 – Configuration

### On/Off Message

A programmable string can be sent to another device via the RS-232 connector to turn the device on or off. The command is:

**MENU ® Other ® OnOff Setup ® (On Message, Off Message)**

### Message Control

This sets the RS-232 parameters that are used for sending a power on/off message to another device. The command is:

**MENU ® Other ® OnOff Setup ® Message Ctl**

### Test Patterns

#### Warning:

**Test patterns can burn plasma and CRT displays if left on for more than a few seconds.**

The user can select from a large selection of test patterns. While in the test pattern menu the ... and † arrows select a test pattern group. Press the "4" button to step through the test patterns in a group. For many test patterns the intensity can be adjusted from 0 to 100 IRE, in 5 IRE steps, using the ‡ and ^ arrows. Reference test patterns are only affected by the output PC/Video level setting. Adjustable patterns allow viewing the effect of the output color management settings. The Warm Up test pattern displays a 20 IRE to 50 IRE gray screen.

To exit the test pattern command but leave the pattern on-screen, press "OK". You can then adjust various parameters to judge their effect on the pattern. Press "Prev" to then toggle between the source and the pattern. Press "Alt" to jump back into the pattern command. The "Prev" and "Alt" functions are only valid if leave the pattern on-screen by pressing "Ok". The command is:

**MENU ® Other ® Test Pattern® Pattern ® (Reference, Adjustable, Warm up)**

### Trigger Out

This command controls the two trigger outputs on the rear panel. By default Trigger 1 is on for when power is on, and Trigger 2 is on when the input aspect ratio is selected as 2.35 aspect. There is a setting to control the trigger with RS-232 commands. The command is:

**MENU ® Other ® Trigger Out® (Trigger1, Trigger2), (On at Power-up, Under RS232 control, Off at Power-up, Off if 2.35 aspect, On if 2.35 input aspect, Off if 4:3 aspect, On if 4:3 input aspect)**

### Remote Control

Allows changing the default command usage of the arrow buttons on the remote. By default the Up/Down arrow buttons can be used to control zoom. The Right/Left arrow buttons can be used to select the input aspect ratio. You can turn off these additional functions by selecting "Off". The command is:

**MENU ® Other ® Remote Ctl ® (Up/Down arrows, Rt/Left arrows) ® (On, Off)**

### Zoom Step

This command sets the size of the Zoom step to 5% or 15%. The command is:

**MENU ® Other ® Zoom step ® (5%, 15%)**

### LED Setup

This command controls the operation of the Green LED on the front panel. The LED can be set to "Green" to be a power on indicator or set to "Dark" so that it is off when the Radiance is operating. The command is:

**MENU ® Other ® LED Setup ® (Green, Dark)**

### RS-232 Setup

With echo on the Radiance will echo all characters sent to it. With echo off the Radiance will only send a message at power on/off. With echo set to off with status, the power on/off messages are changed to status responses. See Tech Tip 11 for delimiter usage and more details. The command is:

**MENU ® Other ® Zoom step ® (Echo, Delimiters) ® (On, Off)**

## Section 5 – Configuration

### **Configuration Memory Usage**

By default, when a configuration memory (A-D) is chosen the selection applies to all inputs. For example if input 1A is active, then input 2 is selected followed by selecting “MemB,” if input 1 is again selected, it would use configuration memory 1B. This is called the “Common” configuration memory mode. Generally this mode is used when specific day and night calibrations are desired and used for all inputs.

You can set the memory usage to be “Per Input.” That is the configuration memory selection is independent for each input. In this mode, using the example above, starting with input 1A, changing to input 2, pressing “MemB” and finally selecting input 1, results in using configuration memory 1A.

The command is:

**MENU ® Other ® Memory Usage ® (Common, Per Input)**

# Section 6 - Calibration

## **Section 6 - Calibration**

Your theater system needs to be calibrated. To brighten the image in the show room, most display manufacturers intentionally change the display calibration away from industry standards. Unfortunately most displays do not have the controls necessary to undo this situation. Correcting these intentional errors, and other unintentional errors, so the image appears as the producers intended, is a primary function of the Radiance. The Radiance has a host of features dedicated to this task.

It is recommended that a professional calibrator be hired to perform the calibration. An experienced professional calibrator has the necessary tools and experience to extract the best performance from your theater. However, you can improve your picture without hiring a professional if you prefer. You will need to learn how to use the Lumagen test patterns, and have either a test-pattern generator or a calibration disc (such as AVIA or Digital Video Essentials). Then you need to spend time learning how various calibration controls interact and how they affect image quality.

To understand Radiance calibration, it is important to note that setup and calibration parameters are split into "input memories" and "output configurations." Input memories are for source specific setup and calibration. Output configurations deal with display setup and calibration. These are covered elsewhere in this manual.

It is recommended that the internal Lumagen test patterns be used to calibrate the output configuration. This will assure that any variance between sources (size, color or levels) do not affect the calibration of the display. Note that some professional calibrators prefer to use a test pattern generator for all calibration functions. This method can also work well. After the display has been calibrated, differences between inputs can be calibrated using test patterns played on the source devices or test pattern generators.

The recommended Lumagen calibration sequence is shown below.

### **Set the display's picture controls to neutral**

- Disable enhancement features on the display. Features such as sharpness, DRC and certain color mode settings do not live up to their advertising and can actually reduce image quality. In addition the Lumagen enhancement features work best when the display is set to have it's own enhancement features disabled.
- Select the display color temperature setting that is closest to the "D65" for white. This is often referred to as "D65," "warm," or "cinema" color mode, but this varies between manufacturers.

### **Calibrate black and white levels using display controls**

- To calibrate the black and white levels in the display, select the Lumagen contrast test pattern. Use the right-arrow key to select the Contrast 1 (or Contrast 2) test pattern. The Contrast 1 pattern has two white rectangles and two black rectangles. In the dark areas, there are two vertical bars, one at 4 IRE and one at -4 IRE. The white area has two vertical bars, one at 96 IRE and one at 104 IRE. Note that 0 IRE is reference black and 100 IRE is reference white. Since -4 and 104 are outside the nominal black to white range, not all displays will show these levels. The test pattern command is:

**MENU ® Other ® Test Pattern ® Reference ® OK**

- Adjust the black level using the display's brightness control. Adjust so that the 4 IRE bar is barely visible against the black background (0 IRE). There should be no visible difference between the black background areas and the -4 IRE bar. This is a secondary indication verses the 4 IRE bar, but can be useful in optimizing the black level in displays that support blacker-than-black.
- Adjust the white level using the display's contrast control. Adjust so that the 96 IRE bar is still visible against the white (100 IRE) background. If a display supports whiter-than-white, the 104 IRE bar may be visible. This is not a requirement, but does show if there is headroom above white.
- Check your results with a realistic image. Some displays can be adjusted so that the 96 IRE bar is visible but the image does not look it's best due to a too-high contrast setting. In this case adjust the display's contrast control to reduce the maximum brightness until the video image looks good.
- If either the 4 IRE and/or 96 IRE bars cannot be made visible after adjusting the controls, check that the appropriate Lumagen output level (Video or PC) has been selected. The command is:

**MENU ® Output ® Configs ® [Config] ® HDMI Format ® Type ® (PC, Video)**

# Section 6 - Calibration

## Color Management

The Radiance Color Management System (CMS) controls are used to calibrate display grayscale tracking, gamma plus primary, and secondary, colors. The use of these controls requires advanced knowledge and special equipment. We suggest that a qualified video technician be hired to do this calibration.

### Calibrate 100 IRE white to D65 using the display's controls

- It is best to calibrate the 100% white point color-of-gray in the display when possible. If the display has a custom grayscale control, calibrate the 100% white point as described below. Otherwise skip this step.
- Note again that Lumagen recommends that a qualified video technician be hired to calibrate grayscale.
- To calibrate the 100 IRE color-temperature point using the display's controls, select the Lumagen 100 IRE window test pattern. This pattern has a white window on a black background. Navigate to the Lumagen test pattern menu and then use the right-arrow key to step to the 100 IRE Window test pattern. The command is:

**MENU ® Other ® Test Pattern ® Reference ® OK**

- Adjust the color temperature of 100% white to D65 using the display custom grayscale calibration controls. Note that, if the color gamut is to be calibrated, the selected color temperature in the display should be one where the red, green and blue primaries are outside the CIE color triangle for the desired color space.
- Some high-end displays have advanced calibration menus. An experienced calibrator may choose to use some these features to do additional calibration before calibration is completed using Lumagen controls.

### Calibrate Radiance primary color gamut

- Many digital displays have over-saturated primaries. The Radiance CMS controls allow the characteristics of the primary and secondary colors to be corrected. Note that the primary colors can only be repositioned within the triangle that is defined by the position of the display's uncorrected primary colors. If a display has under saturated primary points (such as on typical CRT based displays) they cannot be corrected.
- Note that if needed in the Radiance, the 100% white point should be adjusted using the gamut white-point calibration rather than the grayscale calibration menu.
- The Radiance menu mode must be set to "Service mode" to make changes. The command is:

**MENU ® Other ® Menu mode ® Service mode ® OK**

- The gamut calibration command usage is described in a Tech Tip on the Lumagen support web page. The command is:

**MENU ® Output ® Configs ® [Config] ® Color Mgmt® Color Gamut ® OK**

### Calibrate Radiance grayscale and gamma

- Grayscale and gamma should be calibrated at this point. Calibrating these parameters is an essential part of the video calibration process. The display should have been set to a color temperature close to D65, and the 100 IRE white point should be calibrated using the display controls or the Radiance gamut white-point, if feasible. Then the Lumagen parametric grayscale controls should be used to calibrate the other gray levels.
- Grayscale calibration adjusts the "color of gray" so that the color "gray" adheres to industry standards (D65 point for color images), at all levels from black to white. The command is:

**MENU ® Output ® Configs ® [Config] ® Color Mgmt® Gray/Gamma ® OK**

- Gamma is the response curve between black and white and also has an industry defined standard that should be followed. Lumagen has developed a unique 2,5,11,12 or 21 point parametric grayscale/gamma calibration feature, which allows both grayscale and gamma to be optimized over the entire range from black to white, and not just at one or two points. The command is:

**MENU ® Output ® Configs ® [Config] ® Color Mgmt® Gray/Gamma ® OK**

- After completing the output calibration, copy the results to all configuration memories. The command is:

## Section 6 - Calibration

### **MENU** ® **Output** ® **Copy** ® **OK**

- It is a good idea to save the configuration before proceeding. The command is:

### **MENU** ® **Save** ® **Ok** ® **OK** ® **OK**

### **Iterate the gamut and grayscale/gamma calibrations**

- Since the gamut and grayscale/gamma calibrations interact to some degree, it is important to repeat both until good results for both are achieved. Note that the following step, color/hue, also interacts with these controls.

### **Calibrate Radiance output color and hue**

- If gamut, grayscale/gamma have been calibrated using a color probe, or spectral radiometer, and the display suffers from red-push, green-push, or blue-push, the Output Configuration color and hue controls can be used to correct the resulting errors in flesh tones.
- If no gamut or grayscale calibration has been done, color and hue, and color/hue offsets can still be used to improve color fidelity using colorbar patterns and color filters. It should be noted that color filters are not ideal and so whenever possible gamut, grayscale/gamma and color/hue should be calibrated using a color probe or a spectral radiometer as noted above. Set the Color (**Color**) and Hue (**Hue**) controls in the Radiance output menu using a colorbar pattern and a blue filter. The procedure used to accomplish this is described on DVD test discs such as AVIA. Next set the red color (**Color Red**) and Hue (**Hue Red**) offsets using a red colorbar pattern and a red filter. Finally set the green color (**Color Green**) and Hue (**Hue Green**) offsets using a green colorbar pattern and a green filter. Set the menu mode to "service mode," select Radiance color-bar pattern with the menu command. While the pattern is displayed, pressing menu leaves the pattern up and directly selects the color/hue menu. The command is:

### **MENU** ® **Other** ® **Test Pattern** ® **Adjustable** ® [select pattern] ® **OK**

### **MENU** ® **Output** ® **Configs** ® [Config] ® **Color Mgmt** ® **ColorDecoder** ® **OK**

### **Iterate gamut, grayscale/gamma and color/hue calibrations.**

- Since the gamut, grayscale/gamma, and color/hue calibrations interact to some degree, it is important to repeat all three steps until good results for both are achieved.

### **Calibrate Radiance input overscan, black, white, color and hue**

- The Lumagen provides four independent input configuration memories for each input. Calibration for each input is independent of the other inputs and multiple independent calibrations can be done for each input. One use for the multiple calibrations for each input is to calibrate MEMA for day and MEMB for night viewing. Also, each input memory has separate calibrations for each of eight input resolutions [See the Memory Configuration section]. Typically the DVD, or Bluray, input is calibrated first, using a DVD, or Bluray, calibration disc, or you can connect a video test pattern generator. Then the results of this calibration are then copied to all input memories as a reference starting point for the other sources. However, any source can be calibrated first if you prefer.
- Set the Lumagen input aspect ratio as **4:3** (1.33) for a 4:3 screen, **16:9** (1.76) for a 16:9 screen, or **2.35** for a projector with a 2.35 anamorphic lens. The input aspect ratio should be set before adjusting the overscan.
- Display an "Overscan" test pattern from the selected source.
- Adjust the input size and position. This selects which pixels are captured. Adjust the top-left corner of the image first. Then adjust the bottom-right corner. For digital 1080i/p 16:9 sources input size should only be adjusted if absolutely necessary for 1080p 16:9 screens, so that the scaling will remain off, which in turn will keep the image as sharp as possible. The command is:

### **MENU**® **Input**® **Video Setup**® [Resolution]® **Size**® [Aspect]® (**Crop TopLeft**, **Crop BotRGHT**)

- Display a "contrast" or a "Needle Pulses" test pattern.
- Set the black level. Since the Lumagen-to-display levels were set above in the Output Calibration section, the Lumagen internal input-memory *Black* level control should be used. This allows differences between sources to be corrected. Note that many cable and satellite services use different black levels for standard definition and high-definition sources. Using a Radiance is one of the few ways you can correct this error. It is recommended that you use a low average picture

## Section 6 - Calibration

level test pattern, which has a black frame with two moving bars (2 and 4 IRE) for setting black level. The reason is that the black level varies with the average intensity on the screen for many displays. Since the black level is most critical in dark scenes this will provide the best setting. The command is:

**MENU® Input® Video Setup® [Resolution]® Picture® Black® OK**

- Set the white level (contrast). Since the Lumagen-to-display levels were set above in the Output Calibration section, the Lumagen internal input-memory *Contrast* control should be used. The command is:

**MENU® Input® Video Setup® [Resolution]® Picture® White® OK**

- Display a "Colorbar" test pattern, sometimes referred to as an "SMPTE bar" test pattern.
- Set Color and Hue and then the Color and Hue offsets for red and green. The display's Color and Hue should have been set to default before performing any calibration steps. First set Color and Hue using the blue colorbar pattern and the blue filter. Next set the red color (**Color Red**) and Hue (**Hue Red**) offsets using the red colorbar pattern and the red filter. Finally set the green color (**Color Green**) and Hue (**Hue Green**) offsets using the green colorbar pattern and the green filter. The command is:

**MENU® Input® Video Setup® [Resolution]® Picture® ColorDecoder® OK**

- Display a "Y/C Delay" test pattern.
- Set Y/C Delay. Use the Lumagen Control to minimize the error in the blue and red timing verses Luma. The  $C_B$  and  $C_R$  channels are calibrated independently.

**MENU® Input® [Resolution]® Picture® YC Delay® OK**

- You may wish to copy the calibrated configuration to all configuration memories as a starting point.

**MENU® Input® Copy® OK**

- If desired, change to MEMB and repeat the above steps to calibrate for a different amount of room light.
- Calibrate the other inputs.
- Name the inputs, if desired. The command is:

**MENU® Input® Label® OK**

- Lock the configuration, if desired. The command is:

**MENU® Other® Menu Mode® Locked® OK**

- **SAVE THE CONFIGURATION**

**MENU® Save® Ok® OK® OK**

# Section 8 – Appendix

## Section 7 – Command Interface

### Direct Commands

Direct Commands are entered by using the Lumagen remote control. All of these commands can also be entered by using the RS232 interface.

#### Output Vertical Resolution

480p:	<b>MENU 0 2 1</b>	Progressive with 480 active scanlines
540p:	<b>MENU 0 2 2</b>	Progressive with 540 active scanlines
600p:	<b>MENU 0 2 3</b>	Progressive with 600 active scanlines
720p:	<b>MENU 0 2 4</b>	Progressive with 720 active scanlines
768p:	<b>MENU 0 2 5</b>	Progressive with 768 active scanlines
840p:	<b>MENU 0 2 6</b>	Progressive with 840 active scanlines
1080p:	<b>MENU 0 2 7</b>	Progressive with 1080 active scanlines
1080i:	<b>MENU 0 2 8</b>	Interlaced with 1080 active scanlines

#### Output Vertical Rate

Set vertical rate: **MENU 0 4 (50Hz, 60Hz) OK**

#### Output Miscellaneous

Out PLL Clock **MENU 0 9 3 3** Output PLL clock frequency. Use with caution.

#### Output Aspect Ratio

Output aspect ratio: **MENU 0 6 value OK** Example: For 16:9 enter 178

#### Miscellaneous Commands

S/W Rev	<b>MENU 0 9 0 3</b>	Display software revision and serial-number
Menu timeout	<b>MENU 0 9 0 5</b>	Toggle menu timeout. Short (default) or long (saved)
Service Mode	<b>MENU 0 9 1 0</b>	Toggle SERVICE MODE. (not saved)
Unlock menu	<b>MENU 0 9 1 5</b>	Can also be selected using menu
Output defaults	<b>MENU 0 9 9 8</b>	Reset current output to default for current resolution
Factory defaults	<b>MENU 0 9 9 9</b>	Reset to factory default (Must "Save" to make permanent)

# Section 8 – Appendix

## IR Command Interface

### IR Command List

Remote Command	IR-binary	IR-HEX	Description
ON	0010 00 0001 11	207	Power on
STBY	0010 00 0010 11	20B	Power to standby
MENU	0010 00 0111 11	21F	Activate menu
EXIT	0010 10 1001 11	2A7	Exit. Often acts as a cancel key
CLR	0010 00 1001 10	226	Force menu off (i.e. can use to assure menu is off for input selection)
INPUT	0010 10 1010 00	2A8	Choose input
ZONE	0010 10 0111 10	29E	Output zone select
ALT	0010 00 0111 00	21C	Alternate
PREV	0010 10 0110 11	29B	Display previous input
PIP-OFF	0010 10 1010 00	2A8	PIP off
PIP-SEL	0010 00 1010 01	229	PIP select
PIP-SWAP	0010 00 1010 10	22A	PIP swap
PIP-MODE	0010 10 1010 11	2AB	PIP mode
OK	0010 10 1000 01	2A1	Accept command
<	0010 00 1000 00	220	Left arrow
>	0010 10 1000 10	2A2	Right arrow
v	0010 00 1001 01	225	Down arrow
^	0010 10 0111 01	29D	Up arrow
0	0010 00 0101 01	215	Enter the digit 0
1	0010 10 0011 00	28C	Enter the digit 1
2	0010 00 0011 01	20D	Enter the digit 2
3	0010 00 0011 10	20E	Enter the digit 3
4	0010 10 0011 11	28F	Enter the digit 4
5	0010 00 0100 00	210	Enter the digit 5
6	0010 10 0100 01	291	Enter the digit 6
7	0010 10 0100 10	292	Enter the digit 7
8	0010 00 0100 11	213	Enter the digit 8
9	0010 10 0101 00	294	Enter the digit 9
4:3	0010 00 0010 00	208	Input is 4:3 format. Use previous zoom setting.
4:3NZ	0010 10 1111 00	2BC	Input is 4:3 format. No zoom.
LBOX	0010 10 0010 01	289	Input is 4:3 letterbox format. Use previous zoom setting.
LBOXNZ	0010 00 1111 01	23D	Input is 4:3 letterbox format. No zoom
16:9	0010 10 0010 10	28A	Enhanced for 16:9 televisions format. Use previous zoom setting.
16:9NZ	0010 00 1111 10	23E	Enhanced for 16:9 televisions format. No zoom.
1.85	0010 00 0001 00	204	Input is 1.85 format. Use previous zoom setting.
1.85NZ	0010 10 1111 11	2BF	Input is 1.85 format. No zoom.
2.35	0010 10 0001 01	285	Input is 2.35 format. Use previous zoom setting.
MEMA	0010 00 0101 10	216	Select MEMA

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Remote Command	IR-binary	IR-HEX	Description
MEMB	0010 10 0101 11	297	Select MEMB
MEMC	0010 10 0110 00	298	Select MEMC
MEMD	0010 00 0110 01	219	Select MEMD
+10	0010 00 0110 10	21A	Add 10 to the next digit entered
FREEZE	0010 10 1001 00	2A4	Freeze-frame. Any other character resumes
YPRPB	0010 00 1011 00	22C	Output type is HD color-space YPbPr (component)
RGBHV	0010 10 1011 01	2AD	Output type is RGBHV. <enter> completes command
RGBS	0010 10 1011 10	2AE	Output type is RGBS. <enter> completes command
RGsB	0010 00 1011 11	22F	Output type is RGsB. <enter> completes command
480P	0010 10 1100 00	2B0	Select Vertical Resolution = 480p
540P	0010 00 1100 01	231	Select Vertical Resolution = 540p
600P	0010 00 1100 10	232	Select Vertical Resolution = 600p
720P	0010 10 1100 11	2B3	Select Vertical Resolution = 720p
768P	0010 00 1101 00	234	Select Vertical Resolution = 768p
840P	0010 10 1101 01	2B5	Select Vertical Resolution = 840p
1080P	0010 10 1101 10	2B6	Select Vertical Resolution = 1080p
1080I	0010 00 1101 11	237	Select Vertical Resolution = 1080I
ASPECT	0010 00 1110 11	23B	Set Output aspect ratio

### Serial RS232 Command Interface

#### Usage

The RS232 serial interface can be used to control the operation of the Radiance or allow the Radiance to do some simple control of another device. To connect the Radiance to a PC, or another device, use a standard RS232 null modem cable.

There are some commands that require a carriage return and they are listed with a "<CR>" at the end. You can use a carriage return or "{" as a command terminator. Any character outside the legal range for characters, Hex 20 to Hex 7A will act as a terminator. Characters above Hex 7F are masked off with "x7F". Adding a carriage return to the commands that don't require a carriage return may result in a menu being left on the screen.

All commands to query the status of the Radiance begin with "ZQ", followed by another character (currently 'I','S','O'), followed by a 2 digit decimal code. No terminating characters are used with the query commands

The query response always begins with '!' followed by the last 3 characters of the query request, followed by the data for the query using commas to separate, followed by "<CR><LF>".

#### Port Settings

- 9600 Baud
- 8 data bits
- No parity bit
- One stop bit

## Section 8 – Appendix

### Connections

Pin 2 – Receive

Pin 3 – Transmit

Pin 5 and connector shell – Ground

### RS-232 Power OnMessage/OffMessage

Power On/Off Message that can be used to control another device. Can be used to send an ASCII string out the RS-232 port to turn on or off a display. NOTE: Turning “On” RS-232 power

OnMessage/OffMessage in the Radiance menu, turns off echoing of the original query command. The query response will still be sent. The command is:

**MENU ® Other ® OnOff Setup® (On Message, Off Message)**

### Message Control

Set baud rate, parity and gap for the Power On/Off Message. The command is:

**MENU ® Other ® OnOff Setup® Message Ctl**

### On Screen Display Message

Turn On/Off the input display window that is shown at the bottom of the screen when you change inputs. If you use a control system to change inputs on the Radiance you can set OSD enable to “Off”. The command is:

**MENU ® Other ® Menu Control® OSD enable**

### Echo command

When Echo is set to “Off”, the Radiance will only send a message at power on/off.

When Echo is set to “Off with Status”, the status for power or input changes are in the same format as the response to status query commands ZQS02 or ZQI00.

When Echo is set to “On”, the Radiance will echo all characters sent to it.

Also see the “ZE” command.

The command is:

**MENU ® Other ® RS-232 Setup® Echo® (Off, Off with Status, On)**

### Optional start/end delimiters for RS232 commands

When Delimiters is set to “On” or “On with Ack/Nack”, the Radiance accepts RS232 commands in the format “#<command><CR>”. Start is ‘#’. End is <CR> or a terminator. Any character outside the legal range for characters, Hex 20 to Hex 7A will act as a terminator. Characters above Hex 7F are masked off with “x7F”. Commands that already end with a <CR> do not need a second <CR>.

When Delimiters is set to “On with Ack/Nack”, an ack or nack will be given per command. Ack = “!Y”, Nack = “!N”. An ack is given when a ‘#’,<CR> pair is seen with at least one character in between. A nack is generated if unmatched start/end delimiters are seen or if a ‘#’,<CR> pair is sent with nothing in between. The ack does not indicate whether the character(s) in between ‘#’,<CR> represented a valid command.

When Delimiters is set to “On with Csum & Ack/Nack” the Radiance accepts commands in the format: “#NcommandCC<CR>”, where N is a command count from 0-9 (10 just wraps back to 0), and CC is an 8 bit checksum of the previous chars in the command (i.e. “#0ZQS008E<CR>” is a correctly formatted command with a valid checksum). Acks (“!Y”) are sent by the Radiance only when commands are received with matching checksums in this mode. The command count is included in the checksum but is not verified to be incrementing so it can be left unchanged from one command to the next if desired.

The command is:

**MENU ® Other ® RS-232 Setup® Delimiters® (Off, On, On with Ack/Nack)**

## Section 8 – Appendix

### ASCII Command List

Remote	RS232-ASCII	Description
ON	%	Power on
STBY	\$	Power to standby
MENU	M	Activate menu
EXIT	X	Exit. Often acts as a cancel key
HELP	U	Displays on-screen help for highlighted menu item.
CLR	!	Force menu off (i.e. can use to assure menu is off for input selection)
INPUT	i	Choose input (i.e. i2 for input 2 and i+2 for input 12)
ZONE	L	Output zone select
ALT	#	Alternate
PREV	P	Display previous input
PIP-OFF	e	PIP off
PIP-SEL	p	PIP select
PIP-SWAP	r	PIP swap
PIP-MODE	m	PIP mode
OK	k	Accept command
OK	<enter>	Accept command (uses the PC "ENTER" keycode)
<	<	Left arrow ("less-than" key on keyboard)
>	>	Right arrow ("greater-than" key on keyboard)
v	v	Down arrow (lower-case v, as in "vote")
^	^	Up arrow (shift 6 key on keyboard)
0	0	Enter the digit 0
1	1	Enter the digit 1
2	2	Enter the digit 2
3	3	Enter the digit 3
4	4	Enter the digit 4
5	5	Enter the digit 5
6	6	Enter the digit 6
7	7	Enter the digit 7
8	8	Enter the digit 8
9	9	Enter the digit 9
+10	+	Add 10 to the next digit entered
NLS	N	Non Lineal Scaling
4:3	n	Input is 4:3 format. Use previous zoom setting.
4:3NZ	[	Input is 4:3 format. No zoom.
LBOX	l	Input is 4:3 letterbox format. Use previous zoom setting.
LBOXNZ	]	Input is 4:3 letterbox format. No zoom
16:9	w	Enhanced for 16:9 televisions format. Use previous zoom setting.
16:9NZ	*	Enhanced for 16:9 televisions format. No zoom.
1.85	j	Input is 1.85 format. Use previous zoom setting.
1.85NZ	/	Input is 1.85 format. No zoom.
2.35	W	Input is 2.35 format. Use previous zoom setting.
2.35NZ	K	Input is 2.35 format. No zoom.
MEMA	a	Select MEMA
MEMB	b	Select MEMB

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Remote	RS232-ASCII	Description
MEMC	c	Select MEMC
MEMD	d	Select MEMD
	g	Onscreen messages on
	s	Onscreen messages off
FREEZE	z	Freeze-frame. Any other character resumes
480P	A	Select Vertical Resolution = 480p
540P	B	Select Vertical Resolution = 540p
600P	C	Select Vertical Resolution = 600p
720P	D	Select Vertical Resolution = 720p
768P	E	Select Vertical Resolution = 768p
840P	F	Select Vertical Resolution = 840p
1080P	G	Select Vertical Resolution = 1080p
1080I	I	Select Vertical Resolution = 1080I
ASPECT	=	Set Output aspect ratio (i.e. =178 <enter>, for 16:9 displays)
	_	The no-op character is ignored, between commands, by the RS232 interface. The underscore character can be used inside a message command.
	tXMM	Test Pattern command: X is a letter 'a'-'p' corresponding to the 16 available test patterns. MM: 0-10 corresponds to 10%-100% stepping by 10%. MM: 11-20 corresponds to 5%-95% stepping by 10%. Sending 'X' will exit. Note: the "TxMM" test pattern rendering command is an older command and the letters used to render test patterns don't match the letters returned by the newer "ZQ102" query command.
	taMM	Crosshatch
	tbMM	Overscan (always displayed as 100 IRE)
	tcMM	Contrast (always displayed as 100 IRE)
	tdMM	Every other Hline (always displayed as 100 IRE)
	teMM	Every other Vline (always displayed as 100 IRE)
	tfMM	Ramp (always displayed as 100 IRE)
	tgMM	White Window
	thMM	White Solid
	tiMM	75% Colorbars (always displayed as 75 IRE)
	tjMM	Red Solid
	tkMM	Green Solid
	tlMM	Blue Solid
	tmMM	Yellow Solid
	tnMM	Cyan Solid
	toMM	Magenta Solid
	tpMM	Contrast2 (always displayed as 100 IRE)
	tqMM	Red Window
	trMM	Green Window
	tsMM	Blue Window
	ttMM	Yellow Window
	tuMM	Cyan Window
	tvMM	Magenta Window
	tA	Set Adjustable test pattern mode
	tR	Set Reference test pattern mode
	ZBc	Block character-- The character "c" will be displayed as a solid block "i" in onscreen messages. The main usage is to display control settings such as a volume control. Also see command "ZTMxxxx".
	ZC	Clear any onscreen message

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Remote	RS232-ASCII	Description
	ZD<0,1,2,3>	Set Delimiters-- 0=off, 1=on, 2=on with ack/nack, 3=on with checksum and ack/nack. See page 2: "Optional start/end delimiters for RS232 commands".
	ZE<0,1,2>	Set Echo-- 0=echo off, 1=echo on (default), 2=echo off with status. See page 2: "Echo command".
	ZQI00	Basic input info-- returns (logical input#1-18, input memory a-d, physical input #1-18). Example response: "!I00,1,A,1<CR><LF>" for logical input 1, MemA, physical input 1
	ZQI01	Input video-- returns (0=none,1=video active,2=testpat active), vert rate *100, horiz res, vert res, interlaced). Example response: "!I01,1,5992,720,480,1<CR><LF>" for active 480i video
	ZQI02	Input pattern info-- returns ( {On=1,Off=0}, pattern group 'a'-'o', sub pattern #, IRE level 0-100, A/R for adjustable or reference patterns). Example response: "!I02,1,a,1,100,R<CR><LF>" for overscan test pattern on and set to overscan at 100 IRE and reference levels. Note: the letters returned by the newer "ZQ102" query command don't match the letters used in the older "TxMM" test pattern rendering command.  "a,0"=Crosshatch, "a,1"=Overscan, "a,2"=AspectSquares, "b,0"=Contrast1, "b,2"=Contrast2, "c,0"=HLines, "c,1"=VLines, "d,0"=Ramp, "e,0"=GrayWindowMed, "e,1"=GrayWindowSm, "e,2"=GraySolid, "f,0"=100%ColorBars, "f,1"=75%ColorBars, "g,0"=RedWindowMed, "g,1"=RedWindowSm, "g,2"=RedSolid, "h,0"=GrnWindowMed, "h,1"=GrnWindowSm, "h,2"=GrnSolid, "i,0"=BluWindowMed, "i,1"=BluWindowSm, "i,2"=BluSolid, "j,0"=YelWindowMed, "j,1"=YelWindowSm, "j,2"=YelSolid, "k,0"=CynWindowMed, "k,1"=CynWindowSm, "k,2"=CynSolid, "l,0"=MagWindowMed, "l,1"=MagWindowSm, "l,2"=MagSolid. "m,0"=DesaturatdRedWinMed, "m,1"=DesaturatedRedWinSm, "m,2"=DesaturatedRedWinSolid "n,0"=DesaturatedGrnWinMed, "n,1"=DesaturatedGrnWinSm, "n,2"=DesaturatedGrnWinSolid "o,0"=DesaturatedBluWinMed, "o,1"=DesaturatedBluWinSm, "o,2"=DesaturatedBluWinSolid
	ZQI03	Output1 and Output2 config select for current input memory-- returns (Output1<0,1> disabled=0 enabled=1, Output2<0,1>, config select<0-7>) Example response: "!I03,1,0,3" would mean out1 is enabled, out2 is disabled, using output config3
	ZQI04	Current input audio select-- XX=0-5 HDMI, 6-11coax, 12-13 optical, 14-17 stereo
	ZQI05 (Note 1)	Current input black level-- returns -64 to 64>
	ZQI06 (Note 1)	Current input contrast level-- returns -127 to 127
	ZQI07 (Note 1)	Current input color format-- returns 0=auto, 1=Bt.601, 2=Bt.709
	ZQI14 (Note 1)	Current input YC delay-- returns (cr,cb) -31 to 31, multiply value returned by 1/16 of a pixel.
	ZQI15	Current input deinterlacing mode-- returns 0 for "auto", 1 for "film", 2 for "video".
	ZQI16	Current input vertical shift—returns (index,value). Index=0 is off, Index=1-15 is the index of current setting being used and value is the amount (-511-511).
	ZQO02	Output aspect-- returns (current output aspect, followed by 5 output aspects for input aspects 4:3,Letterbox,16:9,1.85,2.35) 110-250 corresponds to 1.10 - 2.50
	ZQO03	Output shrink-- returns (top,left,bottom,right) 000-255 pixels
	ZQO04	Output gamma-- current range is 85-130, corresponding to .85 -1.30
	ZQO15	Output black and contrast-- returns (black,contrast), black is -64 to 64, contrast is -127 to 127
	ZQO16	Output mode name-- Names are same as seen in the menu under Output:Configs:ConfigX:Select Mode. Corresponds to the "ZY44" set output mode by name command.

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Remote	RS232-ASCII	Description
	ZQO17	Output ctemp points-- returns number of ctemp points (2, 5, 11, 12, 21)
	ZQO89	Output color temp-- if using 12 pt returns (IRE point 12), If using 21 pt returns (IRE points 11-20), the value is in range 0-1000, corresponding to 0-100.0 (ZQO09 returns pts 0-10)
	ZQO90	Output color temp-- if using 12 pt returns (R point 12), If using 21 pt returns (R points 11-20), the value is in range 0-1000, corresponding to 0-100.0 (ZQO09 returns pts 0-10)
	ZQO91	Output color temp-- if using 12 pt returns (G point 12), If using 21 pt returns (G points 11-20), the value is in range 0-1000, corresponding to 0-100.0 (ZQO09 returns pts 0-10)
	ZQO92	Output color temp-- if using 12 pt returns (B point 12), If using 21 pt returns (B points 11-20), the value is in range 0-1000, corresponding to 0-100.0 (ZQO09 returns pts 0-10)
	ZQS00	Alive-- returns ("!S00,Ok<CR><LF>") if working
	ZQS01	Id-- returns (model name, software revision, model#, serial #) Example response: "!S01,RadianceXD,102308,1009,745<CR><LF>". Radiance XD model number is 1009, XE will be 1010
	ZQS02	Power-- returns Off="!S02,0<CR><LF>" ,On="!S02,1<CR><LF>"
	ZQS03	Zoom step%-- current values returned are 5,15
	ZQS04	Output trigger status for trigger 1,2- Returns 0 for low, 1 for high Note: NA on RadianceXS
	ZQO00	Basic output info-- returns (current output config 0-7, video on for out1, video on for out2, audio on for out1, audio on for out2). Example response: "!O00,1,1,0,1,1<CR><LF>" output cfg = 1, video out1 is on, video out2 is off, audio out1 is on, audio out2 is on.
	ZQO01	Output mode-- returns (vertical rate * 100, horiz res, vert res, interlaced). Example response: "!O01,5994,1920,1080,0<CR><LF>" for a default 1080p output mode
	ZTMxxxx<CR>	Print message on the screen-- M = '0' to '9'... '9' leaves message until "ZC" sent. 2 lines, 30 characters per line, legal characters " through 'z' (0x20 - 0x7a in hex), a carriage return or '\n' can be used to terminate message. ASCII extended characters set solid block for use as a volume bar. Also see command "ZBc".
	ZY0M<CR>	Set zoom factor to M-- Where M can be 0-2 (or 0-7 if zoom is set for 5% steps)
	ZY1MMM<CR>	Set output aspect ratio to MMM for all input aspects--. Where the valid range is 110-250 which corresponds to 1.10 to 2.50. See "ZY45".
	ZY2MMMNNNOOPPP<CR>	Set output shrink parameters-- Where MMM=top, NNN=left, OOO=bottom, PPP=right edge. Range is 0-255 for each.
	ZY3<1,2><H,L><CR>	Sets trigger-- 1 or 2 either H=on or L=off. For exclusive RS-232 control of the trigger set the Radiance trigger menu to "Under RS232 control" (Menu, Other, Trigger Out, (Trigger1, Trigger2), Under RS232 control). Note: NA on RadianceXS
	ZY40XXX<CR>	Set output color mgmt gamma-- XXX =085-130 which corresponds to 0.85 to 1.30
	ZY43BLSVVV<CR> (Note 1)	Set out black-- S=sign<+,->, VVV = value<000-064>
	ZY43COSVVV<CR> (Note 1)	Set out contrast-- S=sign<+,->, VVV = value<000-127>
	ZY44<ModeName><CR>	Sets up the output mode by name-- Names are same as seen in the menu under Output:ConfigX:Select Mode. Corresponds to the "ZQO16" output mode name command.
	ZY45XMMM<CR>	Sets output aspect to MMM for input aspect X-- X(0=4:3, 1=Letterbox 2=16:9, 3=1.85, 4=2.35) MMM<110-250> which corresponds to 1.10 to 2.50. See "ZY1MMM" command to set aspect ratio for all input aspects.
	ZY46F<CR>	Set output format-- F=0-3 (0=YCbCr422, 1=YCbCr444, 2=RGB-PC, 3=RGB-Vid).
	ZY503XYZ<CR>	Set input memories output config select-- Enable Output1 X<0,1> disable=0 enable=1, Enable Output2 Y<0,1>, Output Config Z<0-7>.

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Remote	RS232-ASCII	Description
		When output is disabled it outputs 1080i blank video.
	ZY504XX<CR>	Set input audio select to XX-- 00-05 HDMI (only valid on HDMI inputs and must match the selected HDMI input) 06-11 coax, 12-13 optical, 14-17 stereo
	ZY505SVVV<CR> (Note 1)	Set input black level-- S=sign<+,-> VVV=value <000-064>
	ZY506SVVV<CR> (Note 1)	Set input contrast level-- S=sign<+,-> VVV=value <000-127>
	ZY507X<CR> (Note 1)	Set input color format-- 0=auto, 1=Bt.601, 2=Bt.709. SD inputs are fixed to Bt.601 and a setting of auto or Bt.709 is ignored.
	ZY514SXSY<CR>(Note 1)	Set input YC Delay-- S=Sign<+,->,XX=Cr delay <00-31> in 1/16 of a pixel, S=Sign<+,->, YY=Cb delay <00-31>
	ZY515X<CR>	Set input deinterlacing mode—0="auto", 1="film", 2="video"
	ZY5160XX<CR> ZY5161XXSVVV<CR>	Set input vertical shift. Can just switch which vertical shift setting is being used with "ZY5160XX" where XX=0-15 (0 is off, 1-15 would be a vertical shift setting). With "ZY5161XXSVVV" you select which shift setting to use (XX) and also set the value (S=sign<+,->,VVV=value <-511,511>)
	ZY520X	Toggle HDMI Hotplug-- useful to get sources to re-read EDID information and possibly change audio or video output formats. X =0-5 corresponds to HDMI input 1-6, 7 corresponds to all HDMI inputs
	ZY6SAVECONFIG<CR>	Save configuration--
	ZY7M<0,1><CR>	Menu position-- 0=default menu, 1=menu at top
	ZY7TGSIII<CR>	Test pattern command-- G=test pattern group 'a' - 'o', S=subpattern number, 0-n. Number of subpatterns depends on the group, III = IRE, 000-100. Will round to nearest step of 5. This command matches the format of the test pattern status command and should be used instead of old "tXMM" command.

(Note 1) The current input setting is combined with the current output setting. The actual setting used is limited to the maximum range of the register.

# Section 8 – Appendix

## **Section 8 – Appendix**

### **Specifications**

#### **Input**

- 18 video inputs:
  - 6 HDMI 1.1 (RadianceXD), or 6 HDMI 1.3 (RadianceXE). (480i to 1080p60)
  - 4 Component, SD/HD (480i to 1080i and PC up to 1280x1024 at 60 Hertz)
  - 4 SVideo (480i, 576i)
  - 4 Composite (480i, 576i)
- 18 audio inputs:
  - 6 HDMI 1.1 (RadianceXD), or 6 HDMI 1.3 (RadianceXE)
  - 4 Analog Stereo
  - 2 Digital Optical
  - 6 Digital COAX
- Automatic detection for NTSC, PAL and SECAM
- Analog inputs support NTSC (M, Japan, 4.43), PAL (B, D, G, H, I, M, N, Nc) and SECAM (B, D, G, K K1, L).
- Analog audio and video inputs, absolute maximum rating is  $\pm 1$  volts, referenced to case

#### **Processing**

- 10-bit processing
- Proprietary Lumagen “No-ring”™ scaling
- Each input has 4 user configuration memories, with 8 resolution sub-memories for each
- 2:2, 3:2 and 3:3 pull-down for SD/HD film sources
- Per-pixel SD/HD video de-interlacing
- Adaptive diagonal filtering
- MPEG mosquito and block artifact reduction
- Temporal noise reduction for SD/HD sources
- User programmable non-linear-stretch (NLS) mode, 4:3 to 16:9 or 16:9/1.85 to 2.35
- 4:3, LBOX, 16:9, 1.85, 2.35 and NLS input aspect ratios
- Programmable output aspect ratio from 1.33 to 2.50
- Support for anamorphic lenses
- Extensive suite of test patterns
- Parametric grayscale calibration, 2,5,10,11 or 21 point
- Parametric Gamma calibration, 2,5,10,11 or 21 point
- Programmable input/output color-space
- Y/C-delay calibration
- User-adjustable image enhancement
- CUE and ICP filtering
- Supports HDCP

#### **Output**

- 2 HDMI 1.1 (RadianceXD), or 2 HDMI 1.3 (RadianceXE) outputs, 480p to 1080p and 1080i
- Eight channel audio at 192 kHz
- RadianceXE (HDMI 1.3) also supports DD True-HD™, and DTS Master Audio™
- Each HDMI output provides “stand-by” power to external device of +5V at 50 mA
- 2 Digital COAX audio

#### **Miscellaneous**

- Two 12-volt trigger outputs
- IR and RS232 control (See Tech Tip 11)
- LVTTTL IR format command input LVTTTL IR format command input (See Tech Tip 9)
- Universal Power Supply, INPUT: 100-240V at ~50/60Hz. OUTPUT: 12.0 VDC, 5.0A
- Power consumption: 24 Watts
- Rack mounting ears